Bendix

rospace
stems Division

Preliminary Parts Application Analysis
Lunar Surface Gravimeter Experiment

NO.	REV. NO.
ATM-979	

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DATE 2/18/71

Prepared by _____
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Approved by _____
S. J. Ellison, Manager
ALSEP Reliability

The purpose of this ATM is to document the results of the Parts Application Analysis study conducted on the Lunar Surface Gravimeter experiment less the La Coste and Romberg sensor. This LSG represents the Bendix and ADL design electronics which uses a high degree of high reliability parts and integrated circuitry.

The stress levels shown were determined on the basis of electronic piece parts operating at their nominal values of resistance, capacitances, etc. Temperature of 50°C was used for determining device ratings. The resultant stress ratios provided the basis for determining the devices for low failure rate. In addition, all stress levels were evaluated in terms of maximum applied voltage and current levels to preclude misapplication during peak or translational periods.

The attached summary sheets (Table I) demonstrates that all parts are applied within both ALSEP and Bendix established derating criteria (ATM-241E). From the analysis it can be concluded that the LSGE electronic parts will be operating at electrical stresses well below the recommended levels for hi-rel applications.

This ATM will be updated prior to CDR.

TABLE I

LSGE DERATING SUMMARY

BxA Electronics

Quantity	Component	BxA Derating
330	Microcircuits	50 to 70% current loading or 40 to 60% fan out
345	Resistors	1 to 10% of rated power
142	Semiconductors	1 to 15% of rated power
179	Capacitors	1 to 30% of rated voltage

ADL Components

Connectors	50% of rated current
Arrestment Motor	33% of rated torque
Clutch	32% of rated torque
Mass Changing Motor	33% of rated torque
Coarse Screw Motor	12% of rated torque
Fine Screw Motor	12% of rated torque
Heater Box Heater	60% of rated current
Instrument Housing	(Night) 80% of rated current (Day) 3% of rated current

PARTS APPLICATION ANALYSIS SUMMARY

PROJECT: LSG
ASSEMBLY: _____ SUB ASSEMBLY: _____ SCHEMATIC NO: _____
DATE: 2/15

DEVICE TYPE	TOTAL NO. USED	TOTAL FAILURE RATE	COMMENTS
CAPACITORS	179	0.086703	
RESISTORS	345	0.077868	
DIODES	96	0.176940	Combined
TRANSISTORS	46		Combined
RELAYS	16	0.064000	
TRANSFORMERS	5	0.010000	
MICROCIRCUITS	330	0.359000	
		0.774511	

TOTAL LSG FAILURE RATE 0.774511 %/1000 HOURS

MEAN-TIME-TO-FAILURE 130,000 HOURS

MISSION SUCCESS PROBABILITY _____

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Integrator SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. 1	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY 2	MANUFACTURER 3	MAX. TEMP °C: AMBIENT ACTUAL T_A 4	MAX. TEMP °C: JUNCTION RATED T_J 5	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C 6	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT 7	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE 8	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A 9	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C 10	AVG PWR DISSIPATION (mw): ACTUAL 11	POWER RATIO: ACTUAL/RATED (Amb. or case) 12	POWER RATIO: ACTUAL T_A or T_C / RATED 13	MAXIMUM VOLTAGES: V_{CBO} RATED V 14	MAXIMUM VOLTAGES: V_{CB} ACTUAL V 15	MAXIMUM VOLTAGES: V_{CEO} RATED V 16	MAXIMUM VOLTAGES: V_{CE} ACTUAL V 17	DIODE PIV: RATED V 18	DIODE PIV: ACTUAL V 19	CIRCUIT FUNCTION or APPLICATION 20	PART SPECIAL ENVIRONMENT (Define) 21	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) 22	SOURCE (See below) 23	FAIL RATE 24	MULTIPLIER 25	FINAL FAIL RATE (%/1000 HRS) 26	TOTAL PER TYPE 28	COUNT 29	TOTAL FAILURE RATE (%/1000 HRS) 27
CR1	SIN4942 Rectifier	Semtech Corp.	50	175		4W		4W		180	4.5%						200	50	Recovery High Current			A						.0014
CR2	" "	"	50	175		4W		4W		180	4.5%						200	50	"			A						.0014

28 FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

29 NOTE: R is assumed the transient and peak power does not exceed the safe limit.

30 TOTAL FAILURE RATE .0028 %/1000 HRS.

form BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board #7 SUB ASSEMBLY: Seismic Filter SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. 1	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY 2	MANUFACTURER 3	MAX. TEMP °C: AMBIENT ACTUAL T_A 4	MAX. TEMP °C: RATED JUNCTION T_J 5	MAX. TEMP °C: ACTUAL CASE HOT SPOT T_C 6	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT 7	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE 8	AVG PWR DISSIPATION (mw): ACTUAL T_A AMBIENT 9	AVG PWR DISSIPATION (mw): ACTUAL T_C CASE 10	AVG PWR DISSIPATION (mw): ACTUAL 11	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case) 12	POWER RATIO: ACTUAL/RATED T_A or T_C 13	MAXIMUM VOLTAGES: V_{CBO} RATED V 14	MAXIMUM VOLTAGES: V_{CB} ACTUAL V 15	MAXIMUM VOLTAGES: V_{CEO} RATED V 16	MAXIMUM VOLTAGES: V_{CE} ACTUAL V 17	DIODE PIV: RATED V 18	DIODE PIV: ACTUAL V 19	CIRCUIT FUNCTION or APPLICATION 20	PART SPECIAL ENVIRONMENT (Define) 21	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) 22	SOURCE (See below) 23	FAIL. RATE 24	MULTIPLIER 25	FINAL FAIL RATE (%/1000 HRS) 26	TOTAL PER TYPE 28	COUNT 27	TOTAL FAILURE RATE (%/1000 HRS)
CR1	SIN 4942 Sil. Rechtifier	Semtech Corp	50	175		4W		4W		180	4.5%						200	50	Recovery High Currents			A						.0014
CR2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

29 FAILURE RATE SOURCE (See Column 23)
A ATM 005 C
B D

30 NOTE: It is assumed the transient and peak power does not exceed the safe limit.

31 TOTAL FAILURE RATE .0028 %/1000 HRS.

Form BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG

ASSEMBLY: Board 4 and 5

SUB ASSEMBLY: Screw Servo Central &

DATE: 1/20/71

SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	RATED JUNCTION T_J (5)	CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT (7)	RATED AT 25°C CASE (8)	ACTUAL AMBIENT T_A (9)	ACTUAL CASE T_C (10)	ACTUAL (11)	POWER RATIO: ACTUAL °C BELOW RATED (Amb. or case) (12)	ACTUAL T_A OR T_C BELOW RATED (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	V_{CB} ACTUAL V (15)	V_{CEO} RATED V (16)	V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL RATE (%/1000 HRS) (26)	TOTAL COUNT PER TYPE (27)	TOTAL FAILURE RATE (%/1000 HRS) (27)
12	SIN β4942 Sil Rectifier		50	175		4W		4W		180	4.5%						200	50	Recovery High Current			A					.0160
4	SIN 91613 Sil Switch			200		250		214		< 1	< 1%						75	12	Switch								.0020
4	transistor Silicon PNP S2N2907A			200		400		343		< 1	< 1%		60		60				Switching								.0078
4	transistor Sisicon NPN S2N910			200		500		242.5		< 1	< 1%		100		60				Switching								.0078

(28) FAILURE RATE SOURCE (See Column 23)
A ATM 605
B
C
D

(28) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(29) TOTAL FAILURE RATE .0336 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board 6 SUB ASSEMBLY: Mass Change Servo. SCHEMATIC NO:

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A	MAX. TEMP °C: ACTUAL T_A	MAX. TEMP °C: RATED JUNCTION T_J	MAX. TEMP °C: ACTUAL CASE HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL T_A	AVG PWR DISSIPATION (mw): ACTUAL T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED (Amb. or case)	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL PER TYPE	COUNT	TOTAL FAILURE RATE (%/1000 HRS)
CR2	SIN 4942 Sil Switch		50	175		4W		4W		180	4.5%						200	50	Recovery High Current			A						.0014
CR3																													
CR8																													
CR9																													
CR10	SIN 4942 Sil Rectifier	Sem-Tech Cap																											
CR11																													
CR12																													
CR13																													
CR14																													

FAILURE RATE SOURCE (See Column 23)

A ATM 605 C

B D

NOTE: R is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE 0.0126 %/1000 HRS.

FORM

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board 6 SUB ASSEMBLY: Mass Change Servo SCHEMATIC NO:

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED @ 25°C (Amb. or case)	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
CR1	SIN 4942 Sil Rectifier	Sertec Corp	50	175		4W		4W		180	4.5%						200	50	Recovery High Current			A					.0014
CR4	SIN 751A Sil Zener	DKK SON		175		400		400		24	5.8%								Low Voltage Regulator								.00127
CR5		↓																	↓								
CR6	IN4579A Sil Zener	Dickson								35	9%								Reference Zener								
CR7	IN5304 Sil Current Reg	Motorola		200		600		600		20	3.3%								Current Regulator								.00059
Q1	Transistor Sil PNP S2N2907A			200		400		343					60		60				Switching								
Q2																											
Q3																											
Q6																											

FAILURE RATE SOURCE (See Column 23)

A ATM 605 C

B D

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .00816 %/1000 HRS.

BS-321A

PARTS A[illegible]ICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG

DATE: 1/20/71

ASSEMBLY: Board 6

SUB ASSEMBLY: Mass change servo

SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: JUNCTION RATED T_J (5)	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT (7)	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE (8)	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A (9)	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C (10)	AVG PWR DISSIPATION (mw): ACTUAL (11)	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case) (12)	POWER RATIO: ACTUAL T_A or T_C/RATED T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	MAXIMUM VOLTAGES: V_{CB} ACTUAL V (15)	MAXIMUM VOLTAGES: V_{CEO} RATED V (16)	MAXIMUM VOLTAGES: V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	DIODE PIV: ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL FAIL. RATE (%/1000 HRS) (25)	TOTAL FAIL. COUNT PER TYPE (26)	TOTAL FAILURE RATE (%/1000 HRS) (27)
Q7	Transistor Sil PNP S2N 2907A		60	200		400		343		1	1%		60		60				Switching			A					.00195
Q4	Transistor Sil NPN S2N 2222A		↓	↓		500		417		↓	↓		75		40				↓			↓					↓
Q5																												
Q8																												
Q9																												

(28) FAILURE RATE SOURCE (See Column 23)
A ATM-605 C
B D

(29) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(30) TOTAL FAILURE RATE .00975 %/1000 HRS.

Form No. BS-321A

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board 5 SUB ASSEMBLY: Caging Control SCHEMATIC NO:

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case)	POWER RATIO: ACTUAL T_A or T_C/RATED	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
CR2	SIN 916B Sil Switch	50M 60197	50	200		250		214		1	1%						75		Switching			A					.0005
CR3																												
CR5																												
CR6																												
CR4	SIN 4942 Sil Rectifier	85M 03895		175		4W		4W		180	4.5%						200	50	Recovery High Current								.0014
CR7																												
CR8																												
CR1	SIN 963B Sil Zener	85M 01309		175		400		400		15	4%						20		DC Regulator								.00127
Q2	Transistor Sil NPN ZN930A			200		500		417		2	1%		60		60				Low level low amplifier								.00195

FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .00942 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG

ASSEMBLY: Board 5 SUB ASSEMBLY: Caging Control

DATE: 1/20/71

SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: JUNCTION RATED T_J (5)	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT (7)	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE (8)	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A (9)	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C (10)	AVG PWR DISSIPATION (mw): ACTUAL (11)	POWER RATIO: ACTUAL/RATED 25°C (Amb. or case) (12)	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	MAXIMUM VOLTAGES: V_{CB} ACTUAL V (15)	MAXIMUM VOLTAGES: V_{CEO} RATED V (16)	MAXIMUM VOLTAGES: V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	DIODE PIV: ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL FAIL RATE (%/1000 HRS) (25)	TOTAL PER TYPE (26)	COUNT (26)	TOTAL FAILURE RATE (%/1000 HRS) (27)
Q1	transistor Fet 3N 171	motor	50	200		300		257.5		3	1%									low PWR Switching			A					.00195
Q4	transistor Sil PNP S2N 2905A	60198 SOM	50	200		600		514.2		6	1%		60		60					High Speed Switching			A					↓
Q3	transistor Sil PNP SM2N2907A	60198 SOM	50	200		400		343		8	2%		60		60					"			A					↓

(28) FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

(29) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(30) TOTAL FAILURE RATE .00585 %/1000 HRS.

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PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board 14 SUB ASSEMBLY: Shaft Encodes elect. SCHEMATIC NO:

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT ACTUAL T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE ACTUAL T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case)	POWER RATIO: ACTUAL/RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	FINAL MULTIPLIER	FAIL. RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Q1	transistor Sil PNP S2N2905A		50	200		600		514.2		6	1%		60		60				High Speed Switching			A					.00195
Q2	transistor Sil NPN S2N2222A		50	200		500		417		10	2%		75		40				medium speed switching			A					.00195

FAILURE RATE SOURCE (See Column 23)

A ATM 605 C

B D

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .00390 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG

ASSEMBLY: Board 15

SUB ASSEMBLY: Instrument Housing Temp. Control

DATE: 1/20/71

SCHEMATIC NO:

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT	MAX. TEMP °C: ACTUAL T_A	MAX. TEMP °C: RATED JUNCTION T_J	MAX. TEMP °C: ACTUAL CASE HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL °C RATED Amb. or case	POWER RATIO: ACTUAL T_J to T_J RATED	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL PER TYPE	COUNT	TOTAL FAILURE RATE (%/1000 HRS)
Q1	transistor Sil PNP SM2N2907A		50		200		400		343		10	2.5%		60		60				high speed switching			A					.00195
Q2	transistor Sil NPN S2N930						500		417		5	1%								low level " level amplifier								
Q3	transistor Sil PNP S2N3720						1W		857		20	2%		60		60				High current switching								
Q4	transistor Sil PNP ~~SM2N2905A~~						600		514		6	1%								Series Reg								
CR1	IN5292 Current Reg	motorola			↓		660		600		30	5%								current Reg								.00059
CR2	IN4568A Volt Ref	dickson			175		250		250		24	9%								voltage ref								.0007
CR5	SIN 91613 Sil Switch				200		250		214		1	1%						75	12	Switching								.0005
CR6			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓			↓					

FAILURE RATE SOURCE (See Column 23)

A ATM 605 C

B D

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .01204 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board 15 SUB ASSEMBLY: Instrument Housing Temp Control SCHEMATIC NO:

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case)	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL RATE MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
CR8	SIN 4942 Sil Rectifier	Semtec	50	175		4W		4W		180	4.5%						200	50	Relay coil Suppre.			A				.0014
CR9		↓	↓	↓		↓		↓		↓	↓						↓	↓	↓								↓
CR10	LM103-2.4/883 Volt Ref	nazna semi		150		250		220		24	10.8%								Voltage Reg								.0007
CR11		↓	↓	↓		↓		↓		↓	↓						↓	↓	↓								↓

FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .0049 %/1000 HRS.

Note
BS-321A

(SEMICONDUCTORS)

PROJECT: LSG

ASSEMBLY: Board #10

SUB ASSEMBLY: Power Converter

DATE: 1/20/71

SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. 1	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY 2	MANUFACTURER 3	MAX. TEMP °C: AMBIENT ACTUAL T_A 4	MAX. TEMP °C: JUNCTION RATED T_J 5	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C 6	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT 7	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE 8	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A 9	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C 10	AVG PWR DISSIPATION (mw): ACTUAL 11	POWER RATIO: ACTUAL/RATED 25°C (Amb. or case) 12	POWER RATIO: ACTUAL/RATED T_A or T_C 13	MAXIMUM VOLTAGES: V_{CBO} RATED V 14	MAXIMUM VOLTAGES: V_{CB} ACTUAL V 15	MAXIMUM VOLTAGES: V_{CEO} RATED V 16	MAXIMUM VOLTAGES: V_{CE} ACTUAL V 17	DIODE PIV: RATED V 18	DIODE PIV: ACTUAL V 19	CIRCUIT FUNCTION or APPLICATION 20	PART SPECIAL ENVIRONMENT (Define) 21	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) 22	SOURCE (See below) 23	FAIL. RATE 24	MULTIPLIER 25	FINAL FAIL RATE (%/1000 HRS) 26	TOTAL COUNT 27	PER TYPE 28	TOTAL FAILURE RATE (%/1000 HRS) 27
CR1	IN4568A Sil Zener	Dickson	50	175		250		250		8	<1%									Voltage Ref.			A					.0007
CR2	SIN4942 Sil Rectifier	Semtec		175		4w		4w		3	<1%							200	5 50	Recovery High Current								.0014
CR3	" "									5	"								50									
CR4	" "									40	"								40									
CR5	" "									200	1%								40									
CR6	" "									200	"								40									
CR7	" "									40	<1%								40									
CR8	" "									5	"								50									
CR9 & CR10	" "									150	1%								15									

28 FAILURE RATE SOURCE (See Column 23)

A ATM 605 C

B D

29 NOTE: B is assumed the transient and peak power does not exceed the safe limit.

30 TOTAL FAILURE RATE .0119 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG

ASSEMBLY: Board #10

SUB ASSEMBLY: Power Converter

DATE: 1/20/71

SCHEMATIC NO:

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT T_A	MAX. TEMP °C: ACTUAL T_A	MAX. TEMP °C: RATED JUNCTION T_J	MAX. TEMP °C: ACTUAL HOT SPOT T_C	MAX. TEMP °C: ACTUAL CASE T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case)	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL PER TYPE	COUNT	TOTAL FAILURE RATE (%/1000 HRS)
Q_7	Transistor Sil. NPN SRN 2222A	T.I.	50	200		500		417		50	10%		75		40				Switching			A						.00195
Q_8	Transistor Sil. NPN SRN 2222A	"											75		40				"									
Q_3	Transistor Sil. NPN 2N930A	"											60		60				Low Level Ampl.									
Q_4	Transistor Sil. NPN 2N930A	"																	"									
Q_9	Transistor Sil. NPN 2N930A	"				500		417		50	10%		60		60				"									
Q_2	Transistor Sil. NPN JANTX2N3019					800		685		40	5%		140		80				High Current High Freq. Ampl									
Q_5	Transistor Sil. NPN JANTX2N3019																		"									
Q_6	Transistor Sil. NPN JANTX2N3019																		"									
Q_1	Transistor Sil. PNP S2N2907A	MOT	50	200		800		685		40	5%		140		80				High Speed Switching			A						.00195

FAILURE RATE SOURCE (See Column 23)

A ATM 605 C

B D

NOTE: R is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .01755 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Stabilized Oscillator SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. 1	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY 2	MANUFACTURER 3	MAX. TEMP °C: AMBIENT ACTUAL T_A 4	MAX. TEMP °C: JUNCTION RATED T_J 5	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C 6	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT 7	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE 8	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A 9	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C 10	AVG PWR DISSIPATION (mw): ACTUAL 11	POWER RATIO: ACTUAL/RATED 25°C (Amb. or case) 12	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C 13	MAXIMUM VOLTAGES: V_{CBO} RATED V 14	MAXIMUM VOLTAGES: V_{CB} ACTUAL V 15	MAXIMUM VOLTAGES: V_{CEO} RATED V 16	MAXIMUM VOLTAGES: V_{CE} ACTUAL V 17	DIODE PIV: RATED V 18	DIODE PIV: ACTUAL V 19	CIRCUIT FUNCTION or APPLICATION 20	PART SPECIAL ENVIRONMENT (Define) 21	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) 23	SOURCE (See below) 39	FAIL. RATE 24	MULTIPLIER 25	FINAL FAIL RATE (%/1000 HRS) 25	TOTAL FAIL COUNT PER TYPE 26	TOTAL FAILURE RATE (%/1000 HRS) 22
	IN5299 Current Reg.	MOT	50	200		660		600		30	5%									Current Regulator			A				.00059
	IN4574A	Dickson	↓	175		250		250		24	9.6%									Reference			↓				.0021
4	SIN914 Signal		50	200		250		214		10	2.1%							75	12	Signal			A				.00236

28 FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

29 NOTE: R is assumed the transient and peak power does not exceed the safe limit.

30 TOTAL FAILURE RATE .00505 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Stabilized Oscillator SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: JUNCTION RATED T_J (5)	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT (7)	RATED AT 25°C: CASE (8)	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A (9)	ACTUAL CASE T_C (10)	ACTUAL (11)	POWER RATIO: ACTUAL/RATED °C (Amb.or case) (12)	ACTUAL/RATED T_C or T_A (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	V_{CB} ACTUAL V (15)	V_{CEO} RATED V (16)	V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL FAIL RATE (%/1000 HRS) (26)	TOTAL COUNT PER TYPE (27)	TOTAL FAILURE RATE (%/1000 HRS) (27)
CR_1	SIN4942 Rectifier		50	175		4W		4W		180	4.5 %						200	50			Receiver High Current		A					.0014
CR_2	SIN4942 Rectifier		50	175		4 W		4W		180	4.5 %						200	50					A					.0014

(28) FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

(29) NOTE: E is assumed the transient and peak power does not exceed the safe limit.

(30) TOTAL FAILURE RATE .0028 %/1000 HRS.

Note

BS-321A

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Post-Ampl. SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. 1	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY 2	MANUFACTURER 3	MAX. TEMP °C: AMBIENT ACTUAL T_A 4	JUNCTION RATED T_J 5	CASE ACTUAL HOT SPOT T_C 6	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT 7	CASE 8	ACTUAL AMBIENT T_A 9	ACTUAL CASE T_C 10	ACTUAL 11	POWER RATIO: ACTUAL RATED 25°C (Amb.or case) 12	ACTUAL RATED T_A or T_C 13	MAXIMUM VOLTAGES: V_{CBO} RATED V 14	V_{CB} ACTUAL V 15	V_{CEO} RATED V 16	V_{CE} ACTUAL V 17	DIODE PIV: RATED V 18	ACTUAL V 19	CIRCUIT FUNCTION or APPLICATION 20	PART SPECIAL ENVIRONMENT (Define) 21	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) 22	SOURCE (See below) 23	FAIL. RATE 24	MULTIPLIER 25	FINAL FAIL. RATE (%/1000 HRS) 26	TOTAL COUNT PER TYPE 27	TOTAL FAILURE RATE (%/1000 HRS)
CR_1	JANTXIN4153 Switch Bias Signal with Controlled Silicon	T.I.	50	200		500		427		15	3.5 %						75		Switch Bias Signal			A					.00059
CR_2	JANTXIN4153 Switch Bias Signal with Controlled Silicon	T.I.	50	200		500		427		15	3.5 %						75		Switch Bias Signal			A					.00059

28 FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

29 NOTE: It is assumed the transient and peak power does not exceed the safe limit.

30 TOTAL FAILURE RATE .00118 %/1000 HRS.

BS-321A

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Motor Drive Control SUB ASSEMBLY: Tilt-Servo Control SCHEMATIC NO:

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL °C RATED (Amb.or case)	POWER RATIO: ACTUAL LEVEL RATED	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
CR_1 thru CR_8	SIN 4942 Rectifier	Semtec	50	175		4W		4W		180	4.5 %						200	50				A					.0014
CR_{11} thru CR_{17}	SIN4942 Rectifier	"		175		4W		4W		180	4.5 %						200	50	"								.0014
CR_9	SIN916B Sil. Switch	T.I.		200		250		214		< 1	< 1%						75	12	Switching								.0005
CR_{10}	SIN916B Sil. Switch	"				250		214		< 1	< 1%						75	12	"								.0005
Q_1	Transistor Sil. PNP S2N2907A	T.I. MOT Ray				400		343		20	5%		60		60				High Speed Switching								.00195
Q_3	Transistor Sil. PNP S2N2907A	"																	"								
Q_5	Transistor Sil. PNP S2N2907A	"																	"								
Q_7	Transistor Sil. PNP S2N2907A	T.I. MOT Ray	50	200		400		343		20	5%		60		60				High Speed Switching								.00195

FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .01160 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG

DATE: 1/20/71

ASSEMBLY: Board #4

SUB ASSEMBLY: Tilt Servo Control

SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: JUNCTION RATED T_J (5)	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT T (7)	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE (8)	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A (9)	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C (10)	AVG PWR DISSIPATION (mw): ACTUAL (11)	POWER RATIO: ACTUAL / RATED @ 25°C Amb. or case (12)	POWER RATIO: ACTUAL / RATED @ T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	MAXIMUM VOLTAGES: V_{CB} ACTUAL V (15)	MAXIMUM VOLTAGES: V_{CEO} RATED V (16)	MAXIMUM VOLTAGES: V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	DIODE PIV: ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRON-MENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL FAIL RATE (%/1000 HRS) (25)	TOTAL COUNT PER TYPE (26)	TOTAL FAILURE RATE (%/1000 HRS) (27)
Q_2	Transistor Sil. NPN S2N910	T.I. Ray	50	200		500		428.5		50	10%		100		60				Switching			A					.00195
Q_4	Transistor Sil. NPN S2N910	"	↓	↓		↓		↓		↓	↓		↓		↓				↓			↓					↓
Q_6	Transistor Sil. NPN S2N910	"	↓	↓		↓		↓		↓	↓		↓		↓				↓			↓					↓
Q_8	Transistor Sil. NPN S2N910	T.I. Ray	50	200		500		428.5		50	10%		100		60				Switching			A					.00195

(28) FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

(29) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(30) TOTAL FAILURE RATE .00780 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG

ASSEMBLY: Board #15 SUB ASSEMBLY: Temp. Monitor

DATE: 1/20/71

SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: JUNCTION RATED T_J (5)	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT (7)	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE (8)	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A (9)	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C (10)	AVG PWR DISSIPATION (mw): ACTUAL (11)	POWER RATIO: ACTUAL RATED 25°C (Amb. or case) (12)	POWER RATIO: ACTUAL T_J or T_A RATED (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	MAXIMUM VOLTAGES: V_{CB} ACTUAL V (15)	MAXIMUM VOLTAGES: V_{CEO} RATED V (16)	MAXIMUM VOLTAGES: V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	DIODE PIV: ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE ($/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL FAIL. RATE ($/1000 HRS) (26)	TOTAL (27)	COUNT PER TYPE (28)	TOTAL FAILURE RATE ($/1000 HRS) (29)
CR_3	SIN916B Sil. Switch		50	200		250		214		<1	<1%							75	12	Switching			A						.0005
CR_4	SIN916B Sil. Switch		↓	200		250		124		<1	<1%							75	12	"			↓						.0005
CR_2	2340338-1 Voltage Reference Zener T.C.		↓	175		400		400		24	6%									Voltage Reference									.00127
CR_1	IN5290 Current Reg.		50	200		600		600		25	4.1 %									Current Regulator			↓						.00059

(30) FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

(31) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(32) TOTAL FAILURE RATE .00286 %/1000 HRS.

Form BS-321A

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board # 9 and #1 SUB ASSEMBLY: A/D Converter SCHEMATIC NO:

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED 25°C (Amb or case)	POWER RATIO: ACTUAL/RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL RATE (%/1000 HRS)	TOTAL COUNT	PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
CR_1	SIN914 Silicon	50 M 60197	50	200		250		214		<1	<1%						75	12	Switching			A						.0005
CR_2	SIN914 Silicon	"		200				214		<1	<1%						75	12	"									
VR_2	IN4572A Voltage Ref. T.C.	Dickson		175		250		250		24	9.6 %								Voltage Reference									.0007
CR_3	IN5299 Current Reg.	MOT	50	200		600		600		36	6%								Current Regulator			A						.00059

FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .00229 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board #3 SUB ASSEMBLY: Analog Output Buffers SCHEMATIC NO:

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case)	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL FAIL RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
CR_1	SIN914 Sil. Switch	60197 50 M	50	200		250		214		<1	<1%						75	12	Switching			A					.0005
VR_1	IN4572 T.C. Zener	Dickson	↓	175		250		250		20	8%								Temp. Control Zener			↓					.0021
CR_2	IN5299 Current Reg.	MOT	50	200		600		600		33	5.5 %								Current Regulator			A					.00059

FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .00319 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG DATE: 1/20/71

ASSEMBLY: Board #3 SUB ASSEMBLY: Analog Mux SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. 1	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY 2	MANUFACTURER 3	MAX. TEMP °C: AMBIENT T_A ACTUAL 4	MAX. TEMP °C: JUNCTION RATED T_J 5	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C 6	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT 7	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE 8	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A 9	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C 10	AVG PWR DISSIPATION (mw): ACTUAL 11	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case) 12	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C 13	MAXIMUM VOLTAGES: V_{CBO} RATED V 14	MAXIMUM VOLTAGES: V_{CB} ACTUAL V 15	MAXIMUM VOLTAGES: V_{CEO} RATED V 16	MAXIMUM VOLTAGES: V_{CE} ACTUAL V 17	DIODE PIV: RATED V 18	DIODE PIV: ACTUAL V 19	CIRCUIT FUNCTION or APPLICATION 20	PART SPECIAL ENVIRONMENT (Define) 21	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) 22	SOURCE (See below) 23	FAIL. RATE 24	MULTIPLIER 25	FINAL FAIL. RATE (%/1000 HRS) 26	TOTAL PER TYPE 27	COUNT 28	TOTAL FAILURE RATE (%/1000 HRS) 29
CR_1	SIN914 Sil. Switch	60197 50 M	50	200		250		214		<1	<1%							75	12	Switching			A					.0005
CR_2	SIN914 Sil. Switch	60197 50 M	50	200		250		214		<1	<1%							75	12	Switching			A					.0005

30 FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

31 NOTE: It is assumed the transient and peak power does not exceed the safe limit.

32 TOTAL FAILURE RATE .0010 %/1000 HRS.

form

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

PROJECT: LSG

ASSEMBLY: Board #8 SUB ASSEMBLY: Demodulator

DATE: 1/20/71

SCHEMATIC NO:

(Semiconductors)

CKT SYM NO. 1	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY 2	MANUFACTURER 3	MAX. TEMP °C: AMBIENT ACTUAL T_A 4	MAX. TEMP °C: RATED JUNCTION T_J 5	MAX. TEMP °C: ACTUAL CASE HOT SPOT T_C 6	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT 7	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE 8	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A 9	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C 10	AVG PWR DISSIPATION (mw): ACTUAL 11	POWER RATIO: ACTUAL °C RATED 12	POWER RATIO: ACTUAL T_A or T_C RATED 13	MAXIMUM VOLTAGES: V_{CBO} RATED V 14	MAXIMUM VOLTAGES: V_{CB} ACTUAL V 15	MAXIMUM VOLTAGES: V_{CEO} RATED V 16	MAXIMUM VOLTAGES: V_{CE} ACTUAL V 17	DIODE PIV: RATED V 18	DIODE PIV: ACTUAL V 19	CIRCUIT FUNCTION or APPLICATION 20	PART SPECIAL ENVIRONMENT (Define) 21	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) 22	SOURCE (See below) 23	FAIL. RATE 24	MULTIPLIER 25	FINAL RATE (%/1000 HRS) 26	TOTAL PER TYPE 27	TOTAL FAILURE RATE (%/1000 HRS) 27
Q_1	Transistor FET JANTX2N4857		50	200		360		300		15	4%									Low Power Switching			A				.00195
Q_2	Transistor FET JANTX2N4857		50	200		360		300		15	4%									Low Power Switching			A				.00195

28 FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

29 NOTE: R is assumed the transient and peak power does not exceed the safe limit.

30 TOTAL FAILURE RATE .00390 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

PROJECT: LSG — Demo- INT-OSC — DATE: 2/5/71

ASSEMBLY: Boards #8 & 10 — SUB ASSEMBLY: & PWR Converter — SCHEMATIC NO:

(Inductors & Transformers)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	CONSTRUCTION 4 TYPE OF CASE (SEE BELOW)	5 WIRE SIZE, PRIMARY	6 WIRE SIZE, SECONDARY	7 INSULATION CLASS	8 VA RATING	9 INDUCTANCE AT RATED CUR.	10 SPECIFIED FREQ	11 MISCELLANEOUS	TEMPERATURE (°C) 12 OPERATING AMBIENT HOT SPOT (SURFACE)	13 (AIR METHOD) RISE	14 EST. ACTUAL RISE	15 OPERATING TEMP MAX.	PRIMARY CURRENT 16 ACTUAL	17 RATED	18 PRIMARY VOLTAGE	19 NO. WINDINGS	SECONDARY 20 WINDING NO.	21 VOLTAGE	22 WINDINGS	HIPOT READING 23 VOLTS	24	25 BASIC FAILURE RATE (λ/1000 HRS)	26 SOURCE (SEE BELOW)	27 TOTAL FAILURE RATE (λ/1000 HRS)
																				MW					REL. DEPT USE ONLY		
T1	Demo-INT-OSC DO-T37	UTC							50						3 MA					100					A	.0020
T2	FHA-15																										
T3	DO-T37																										
T1	Power Converter TBD	O. Schott																									
T2																											

28 TYPE OF CASE
A. HER. SEAL
B. VAC. IMP.
C. ENCAP.
D. OPEN

29 FAILURE RATE SOURCES (FOR COLUMN #26)
A. ATM 605 A B.
C. D.

30 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .0100 %/1000 HRS

BxA 321A

RESISTORS

(Resistors)

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: CKT BD No. 7 SUB ASSEMBLY: Free Modes Filter SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	MAXIMUM OPERATING POWER (WATTS)	7 POWER RATIO OPERATING/ RATED	8 MAXIMUM DUTY CYCLE	9 BULK AIR TEMPERATURE °C	10 CIRCUIT FUNCTION OR APPLICATION	11 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	12 SOURCE (SEE BELOW)	13 SPECIAL ENVIRONMENTS (DEFINE)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE (%/1000 HRS)	16 TOTAL RESISTOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)	18
R6	RNR5SC4990DR	MEPCO	499	±.5%	1/10	.001	< 1%	1	50		.178	A		.001			.0018	
R7	RNR5SC4990DR	MEPCO	499	±.5%	1/10	.001												
R8	RNR5SC4810DR	MEPCO	487	±.5%	1/10	.001												
R9	RNR5SC4810DR	MEPCO	487	±.5%	1/10	.001												
R3	RNR5SC8060FR	MEPCO	806	±1%	1/10	.002												
R5	RNR5SC2003FR	MEPCO	200k	±1%	1/10	.35												
R1	MDC	IRC	6.98m	±2%	1/4	.031					.022						.000022	
R2	MDC	IRC	14m	±2%	1/4	.014												
R4	MDC	IRC	14m	±2%	1/4	.014												

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .001146 %/1000 HRS

BS-321A

RESISTORS

(Resistors)

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Stabilized Oscillator SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER (WATTS) OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) @ ΔT °C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT.	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R8	ACR07G472JS	A. Bradley	4.7k	±5	1/4	4.7	2%	1	50		.022	A		.001			.000022
R15	RCR07G103JS	A. Bradley	10k	±5	1/4	10.0	2.5%										
R16	RCR07G333JS	A. Bradley	33k	±5	1/4	8.25	3%										
R7	RCR07G224JS	A. Bradley	220k	±5	1/4	1.08	.2%										
R8	RCRo7G475JS	A. Bradley	4.7m	±5	1/4	< 1	< 1%										
R5	RCRo7G106JS	A. Bradley	10m	±5	1/4	< 1	< 1%										
R6	RNR55C4751FR	MEPCO	4.75k	±1	1/10	4.75	4.75%				.178						.00018
R12	RNR55C1022FR	MEPCO	10.2k	±1	1/10	10.0	10%										
R13	RNR55C1022FR	MEPCO	10.2k	±1	1/10	10.0	10%										
R4	RNR55C2212FR	MEPCO	22.1k	±1	1/10	10.8	11%										
R11	RNR55C2212FR	MEPCO	22.1k	±1	1/10	10.8	11%										
R1	RNR55C2742JA	MEPCO	27AK	±1	1/10	10.3	10%										
R12	RNR55C4752JR	MEPCO	47.5k	±1	1/10	8.3	8.3%										
R2	RCR07G226JS	A. Bradley	22m	±5	1/4	< 1	< 1%				.022						.000022
R3	RNR55C2233FR	MEPCO	221k	±1	1/10	4.5	4.5%				.178						.00018

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .001594 %/1000 HRS

BS-321A

RESISTORS

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Stabilized Oscillator SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT °C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R13	RNR55C1002F	MEPCO	10k	±1%	1/10	10.0	10%	1	50		.178	A		.001			.00018
R12	RNR55C4993F	MEPCO	499k	±1%	1/10	0.45	< 1%										
R11	RNR55C4993F	MEPCO	499k	±1%	1/10	0.45	< 1%										
R14	R6R05G	A. Bradley	70k	±5%	1/8	3.09	2.8%				.022	A					.000022

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A HTM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000562 %/1000 HRS

FORM 0001
BS-321A

RESISTORS

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Post AMP SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) @ 25°C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT.	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR07G512JS	A. Bradley	5.1k	±5%	1/4	3.41	1.5%	1	50		.022	A		.001			.000022
R2	RCR07G512JS	A. Bradley	5.1k	±5%	1/4	3.41											
R3	RCR07G512JS	A. Bradley	5.1k	±5%	1/4	3.41											
R4	RCR07G512JS	A. Bradley	5.1k	±5%	1/4	3.41											
R12	RCR07G103JS	A. Bradley	10k	±5%	1/4	2.50	1%										
R13	RCR07G103JS	A. Bradley	10k	±5%	1/4	2.50	1%										
R10	RCR07G203JS	A. Bradley	20k	±5%	1/4	2.50	1%										
R9	RCR07G105JS	A. Bradley	1m	±5%	1/4	0.23	< 1%										
R8	RNR55G1051FS	MEPCO	1.05k	±1%	1/10	14.0	14%				.178						.00018
R7	RNR55C2151FS	MEPCO	2.15k	±1%	1/10	11.3	11%										
R6	RNR55C4531FS	MEPCO	4.53k	±1%	1/10	4.5	4.5%										
R11	RNR55C4992FS	MEPCO	49.9k	±1%	1/10	0.5	0.5%										
R5	RNR55C1002FS	MEPCO	10k	±1%	1/10	2.50	2.5%										

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .001076 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

(Resistors)

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #2 SUB ASSEMBLY: DIG Line Buffers & Receivers SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR07G203JS	MIL-R-39008	20k	±5%	1/4	1.25	< 1%	1	50		.022 A			.001			.000022

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000022 %/1000 HRS

BS-321A

RESISTORS

PROJECT: LSG

ASSEMBLY: Board H13

SUB ASSEMBLY: Fixed Gain PRE-AMP

DATE: 1/10/71

SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DESIGN)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	MDC	IRC	10m	±2%	1/10	.023	< 1%	1	50		.022 A			.001			.000022
R2	MDC	IRC	10m	±2%	1/10	.023	< 1%	↓	↓		.022 A			.001			.000022
R3	RNR55C9091FR	MEPCO	9.09k	±1%	1/10	.090	< 1%	↓	↓		.178 A			.001			.00018
R4	RNR55C1001FR	MEPCO	1k	±1%	1/10	10	10%	↓	↓		.178 A			.001			.00018

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE : 000404 %/1000 HRS

BS-321A

RESISTORS

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #4 SUB ASSEMBLY: Tilt Servo Control SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R5	RLR07C270G	Corning	27	±2%	1/4	2.4	1%	1	50		.022 A			.001			.000022
R10	RLR07C270G	Corning	27	±2%	1/4	2.4	1%										
R15	RLR07C270G	Corning	27	±2%	1/4	2.4	1%										
R20	RLR07C270G	Corning	27	±2%	1/4	2.4	1%										
R21	RCR07C102G	Corning	1k	±2%	1/4	5.0	2%										
R22	RCR07C102G	Corning	1k	±2%	1/4	5.0	2%										
R23	RCR07C102G	Corning	1k	±2%	1/4	5.0	2%										
R1	RCR07C242G	Corning	2.4k	±2%	1/4	6.5	3.8%										
R6	RCR07C242G	Corning	2.4k	±2%	1/4	6.5	3.8%										
R11	RCR07C242G	Corning	2.4k	±2%	1/4	6.5	3.8%										
R16	RCR07C242G	Corning	2.4k	±2%	1/4	6.5	3.8%										
R3	RCR07C512G	Corning	5.1k	±2%	1/4	1.5	< 1%										
R8	RCR07C512G	Corning	5.1k	±2%	1/4	1.5											
R13	RCR07C512G	Corning	5.1k	±2%	1/4	1.5											
R18	RCR07C512G	Corning	5.1k	±2%	1/4	1.5											
R2	RCR07C103G	Corning	10k	±2%	1/4	1.0											
R4	RCR07C103G	Corning	10k	±2%	1/4	1.0											
R7	RCR07C103G	Corning	10k	±2%	1/4	1.0											

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000396 %/1000 HRS

FORM 9431
BS-321A

RESISTORS

(Resistors)

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #4 SUB ASSEMBLY: Tilt Servo Control SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPS:RATING/ RATED	9 MAXIMUM DUTY CYCLES	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R9	RCR07C103G	Corning	10k	±2%	1/4	1.5	< 1%	1	50		.022 A			.001			.000022
R12	RCR07C103G	Corning	10k	±2%	1/4	1.8											
R14	RCR07C103G	Corning	10k	±2%	1/4	1.7											
R17	RCR07C103G	Corning	10k	±2%	1/4	1.0											
R19	RCR07C103G	Corning	10k	±2%	1/4	1.0											

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000110 %/1000 HRS

BS-321A

RESISTORS

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Demodulator SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) @ 25°C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR05G333JS	A. Bradley	3.3k	±5	1/8	0.84	< 1%	1	50		.022 A			.001			.000022
R4	RCR05G333JS	A. Bradley	3.3k	±5	1/8	2.97	4.2%										
R2	RCR05G334JS	A. Bradley	3.30k	±5	1/8	0.83	< 1%										
R3	RCR05G103JS	A. Bradley	10k	±5	1/8	10	12.5%										

19 FAILURE RATE SOURCES (FOR COLUMN #16)
A. ATM 605 B.
C. D.

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE: .000088 %/1000 HRS

BS-321A

RESISTORS

(Resistors)

PROJECT: LGS DATE: 1/10/71

ASSEMBLY: Board #3 SUB ASSEMBLY: Analog MUX SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) λ_b SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R2	RCR07G104JS	A. Bradley	100k	±5	1/4	2.25	< 1%	1	50		.022 A			.001			.000022
R3	RCR07G104JS	A. Bradley	100k	±5	1/4	2.25	< 1%										
R4	RCR07G104JS	A. Bradley	100k	±5	1/4	2.25	< 1%										
R5	RCR07G104JS	A. Bradley	100k	±5	1/4	2.25	< 1%										
R1	RCR07G103JS	A. Bradley	10k	±5	1/4	2.5	1%										
R6	RCR07G201JS	A. Bradley	200	±5	1/4	5.0	2%										

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000132 %/1000 HRS

FORM 9551

BS-321A

RESISTORS

PROJECT: LGS DATE: 1/10/71

ASSEMBLY: Board #3 SUB ASSEMBLY: Analog Output Buffers SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO, OPERATING/RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DERATING)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R7	RLR05C243J	Corning	24k	±5	1/8	0.96	< 1%	1	33		.275	A		.001			.00027
R8	TLR05C243J	Corning	24k	±5	1/8	0.96	< 1%										
R9	RLR05C243J	Corning	24k	±5	1/8	0.96	< 1%										
R10	RLR05C243J	Corning	24k	±5	1/8	0.96	< 1%										
R16	RNR55C1002FR	MEPCO	10k	±1	1/10	2.5	2.5%				.178						.00018
R15	RNR55C4992FR	MEPCO	49.9k	±1	1/10	4.49	4.5%										
R23	RNR55C4992FR	MEPCO	49.9k	±1	1/10	4.49	4.5%										
R25	RNR55C1652D	MEPCO	16.5k	±.5	1/10	1.48	1.5%										
R5	RNR55C2002D	MEPCO	20k	±.5	1/10	1.25	1.2%										
R11	RNR55C2002D	MEPCO	20k	±.5	1/10	1.25	1.2%										
R19	RNR55C2002D	MEPCO	20k	±.5	1/10	1.25	1.2%										
R20	RNR55C2002D	MEPCO	20k	±.5	1/10	1.25	1.2%										
R22	RNR55C2002D	MEPCO	20k	±.5	1/10	1.25	1.2%										
R1	RNR55C1003F	MEPCO	100k	±1	1/10	2.25	2.2%										
R2	RNR55C1003F	MEPCO	100k	±1	1/10	2.25	2.2%										
R3	RNR55C1003F	MEPCO	100k	±1	1/10	2.25	2.2%										
R4	RNR55C1003F	MEPCO	100k	±1	1/10	2.25	2.2%										

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B

C D

20 CALCULATED MTBF _____ HRS

21 TOTAL FAILURE RATE: .00342 %/1000 HRS

FORM 9201

BS-321A

RESISTORS

(Resistors)

PROJECT: LCS
ASSEMBLY: Board #3
SUB ASSEMBLY: Analog Output Buffers
DATE: 1/10/71
SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or ALPH) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER APPLIED/ OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R17	RNR55C2403D	MEPCO	240k	±.5	1/10	0.86	< 1%	1	50		.178	A		.001			.00018
R21	RNR55C2403D	MEPCO	240k	±.5	1/10	0.86	< 1%										
R12	RNR55C2403D	MEPCO	240k	±.5	1/10	0.86	< 1%										
R14	RNR55C5113F	MEPCO	511k	±1	1/10	0.46	< 1%										
R27	RNR55C4752D	MEPCO	47.5k	±.5	1/10	3.34	3.3%										
R26	RNR556C2132D	MEPCO	21.3k	±.5	1/10	10.44	10%										
R6	RNR55C9092F	MEPCO	90.9k	±1	1/10	0.03	< 1%										
R13	RNR55C	MEPCO	TBD	±.5	1/10												
R24	RNR55C	MEPCO	TBD	±.5	1/10												

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .00162 %/1000 HRS

FORM 0021
BS-321A

RESISTORS

PROJECT: LGS DATE: 1/10/71

ASSEMBLY: Board #1 & 9 SUB ASSEMBLY: A/D Converter SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR05G103JS	A. Bradley	10k	±1	1/8	2.5	5%	1	50		.022	A		.001			.00022
R2					1/8	2.5	5%										
R3					1/8	2.5	5%										
R4					1/8	2.5	5%										
R5					1/8	2.5	5%										
R6					1/8	2.5	5%										
R7					1/8	2.5	5%										
R8					1/8	2.5	5%										
R9					1/8	2.5	5%										
R10					1/8	2.5	5%										
R32	RNR55C1002FS	MEPCO	10k	±1	1/10	2.5	2.5%				.178	A					.00018
R33	RNR55C1002FS	MEPCO	10k	±1	1/10	2.5	2.5%				.178	A					.00018
R34	S102	VISHAY	5k	±.01		5.0					1.78	B					.00178
R29	S102	VISHAY	5k	±.1		5.0											
R21	S102	VISHAY	10k	±.05		2.5											
R24	S102	VISHAY	22k	±.05		1.16											
R22	S102	VISHAY	28.7k	±.05		1.04											
R28	S102	VISHAY	29.9k	±.05		1.19											

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B Assumed
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .01126 %/1000 HRS

BS-321A

RESISTORS

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #1 & 9 SUB ASSEMBLY: A/D Converter SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DESIGN)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R26	S102	VISHAY	30K	0.05		1.19		1	50		1.78	B		.001			.00178
R23	"	"	45K	"		0.54											
R25	"	"	50K	"		0.50											
R30	"	"	TBD	"													
R27	"	"	"	"													
R11	310737	"															
R12	"	"															
R13	"	"															
R14	"	"															
R15	"	"															
R16	"	"															
R17	"	"															
R18	"	"															
R19	"	"															
R20	"	"															
R31	S102	"	5.5K	0.05	4.45												

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B Assures'
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .02848 %/1000 HRS

BS-321A

RESISTORS

(Resistors)

PROJECT: LSG

ASSEMBLY: Board #15

SUB ASSEMBLY: Temperature Controller/ Monitor Assembly

DATE: 1/10/71

SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OF MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	MAXIMUM OPERATING POWER (WATTS)	7 POWER RATIO OPERATING/ RATED	8 MAXIMUM DUTY CYCLE	9 BULK AIR TEMPERATURE °C	10 CIRCUIT FUNCTION OR APPLICATION	11 BASIC FAILURE RATE (%/1000 HRS) AT °C SOURCE (SEE BELOW)	12 SPECIAL ENVIRONMENTS (DEFINE)	13 FAILURE RATE MULTIPLIER	14 FINAL FAILURE RATE (%/1000 HRS)	15 TOTAL RESISTOR COUNT PER TYPE	16 TOTAL FAILURE RATE (%/1000 HRS)
R4	RNR55E1000FR	MEPCO	100	±1%	1/10	3.5	3.5%	1	50		.178 A		.001			.00018
R3	RNR55E9531FR	"	9530	"	1/10	2.7	2.7%									
R5	RNR55E2672FR	"	267K	"	1/10	0.1	< 1%									
R6	RNR55E5902FR	"	59K	"	1/10	0.005	< 1%									
R1	RNR55E1503FR	"	150K	"	1/10	1.5	1.5%									
R2	"	"	"	"	1/10	1.5	1.5%									
R7	"	"	"	"	1/10	1.5	1.5%									

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .00126 %/1000 HRS

BS-321A

RESISTORS

(Resistors)

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Integrator SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R4	RCR05G102JS	Allen Bradley	1.0K	±5	1/8	5.0	4%	1	50		.022	A		.001			.000022
R1	MDC	IRC	10M	±1	<												
R19	"	"	"	"													
R2	TBD																
R5	"																
R6	"																

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000132 %/1000 HRS

BS-321A

RESISTORS

(Resistors)

PROJECT: LSG

DATE: 1/10/71

ASSEMBLY: Board #7

SUB ASSEMBLY: Seismic Amp and Filter

SCHEMATIC NO:

1 CIRCUIT ITEM/DOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50 DEG C (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R13	TBD													.001			.00018
R14	"																.00018
R10	RNR55E1211F	MEPCO	1.21K	±1	1/10	3.0	3.0%	1	50		.178	A					.00018
R16	RNR55E4991F	"	4.99K	"	1/10	.090	<1%										
R4	RNR55E1002F	"	10K	"	1/10	2.5	2.5%										
R17	"	"	"	"	"	2.5	2.5%										
R2	RNR55E6812F	"	6.81K	"	"	2.0	2%										
R1	RNR55E5762F	Allen Bradley	57.6K	"	"	1.8	1.8%										
R15	RCR07G473JS	Allen Bradley	47K	±5	1/4	2.5	1%				.022						.000022
R18	"	"	"	"	"	2.5	1%				.178						.00018
R3	RNR55E137eF	"	137K	±1	1/10	2.25	2.25%										
R11	RNR55E4990D	MEPCO	499	±0.5	1/10	4.49	4.49%										
R12	"	"	"	"	"	4.49	4.49%										
R5	RNR55E5230F	"	523	±1	"	4.0	4%										
R9	RNR55E1213F	"	121K	"	"	2.25	2.25%										
R6	MDC	IRC	1M	±1	1/4	2.5	1%										.00018
R7	"	"	2M	"	1/4	2.5											.00018
R8	"	"	2M	"	1/4	2.5											.00018

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .003082 %/1000 HRS

FORM 9001

BS-321A

RESISTORS

(Resistors)

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #4 & 5 SUB ASSEMBLY: Screw Servo Control SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) @ 40°C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DESTINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
	RCR07G150JS	Allen Bradley	15	±5	1/4	5.0	< 2%	1	50		.002	A		.001			.000022
	RCR0TG910JS	"	91	"	"	5.0	2%										
	RCR07G270JS	"	27	"	"	7.5	3%										
	RCR07G103JS	"	10K	"	"	1.0	< 1%										
	RCR07G512JS	"	5.1	"	"	1.5	< 1%										
	RCR07G242JS	"	2.4K	"	"	6.5	3.8%										
	RCR07G303JS	"	30K	"	"	0.5	< 1%										

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000154 %/1000 HRS

FORM 0000
BS-321A

RESISTORS

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #6 SUB ASSEMBLY: Mass Changing Servo SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO C/S RATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	12 SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DERTMS)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	16 TOTAL RESISTOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)	18
R24	RLR20C470G	Corning	47	±2	1/2	.012	< 1%	1	50		.275	A			.001			.00027	
R25	"	"	"	"	"	.012	< 1%												
R18	RLR20C202G	"	2K	"	"	5.0	1%												
R19	"	"	"	"	"	5.0	1%												
R22	"	"	"	"	"	5.0	1%												
R23	"	"	"	"	"	5.0	1%												
R15	RNR55E1002FR	MEPCO	10K	±1	1/10	2.5	.5%				.178							.00018	
R11	RNR55E1372F	"	13.7K	"	"	2.5	.5%												
R5	RNR55E7872F	"	78.7K	"	"	1.5	< 1%												
R1	RLR07C102G	Corning	1K	±2	1/4	9.0	4%				.275							.00027	
R12	"	"	"	"	"	9.0	4%												
R26	"	"	"	"	"	9.0	4%												
R27	"	"	"	"	"	9.0	4%												
R2	RLR076202G	"	2K	"	"	7.0	3%												
R6	"	"	"	"	"	7.0	3%												
R9	"	"	"	"	"	7.0	3%												
R14	"	"	"	"	"	7.0	3%												

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .00432 %/1000 HRS

FORM 0004

BS-321A

PA PPLICATION ANALYSIS

RESISTORS

PROJECT: LSG

DATE: 1/10/71

ASSEMBLY: Board #6

SUB ASSEMBLY: Mass Changing Servo

SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R20	RLR07C4T2G	Corning	4.7K	±2	1/4	4.7	2%	1	50		.275	A		.001			.00027
R21	"	"	"	"	"	4.7	2%										
R3	RLR076103G	"	10K	"	"	2.5	1%										
R4																	
R8																	
R13																	
R16																	
R17																	
R10	RLR07C203G	Corning	20K	"	"	1.25	< 1%										
R7	RLR076392G	"	39K	"	"	1.0	< 1%										

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .00270 %/1000 HRS

FORM 9031

BS-321A

RESISTORS

(Resistors)

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #5 SUB ASSEMBLY: Caging Control SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL. or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO (% RATING/ RATED)	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT.	14 SPECIAL ENVIRONMENTS (DERATING)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R8	RLR07C102G	Corning	1K	±2	1/4	25	10%	1	50		.275	A		.001			.00027
R7	RLR07C202G	"	2K	"	"	12.5	5%										
R1	RLR07C392G	"	3.9K	"	"	6.59	3%										
R3	RLR07C512G	"	5.1K	"	"	5.1	2%										
R4	RLR07C103G	"	10K	"	"	2.5	1%										
R5	"	"	"	"	"												
R10	"	"	"	"	"												
R6	RLR07C203G	"	10K	"	"												
R2	RLR206105G	"	1M	"	1/2	< 1	< 1%										

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .00270 %/1000 HRS

FORM 6501
BS-321A

RESISTORS

(Resistors)

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #14 SUB ASSEMBLY: Shaft Encoder Electronics SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) @ 40°C 50 DEGREES (SEE BELOW)	13	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR05G103KS	Allen Bradley	10K	±5	1/8	2.5	2%	1	50		.022	A		.001			.00022
thru																	
R76	"	"	"	"	"	2.5	2%				.022	A		.001			.001672
R77	RLR05G203G	Corning	20K	±2	"	1.25	1%				.275						.00027
R78	RLR05G123G	"	12K	"	"	2.02	1.6%										
R79	RLR05G472G	"	4.7K	"	"	4.7	4%										
R80	RLR05G272G	"	2.7K	"	"	1.73	1.4%										
R81	RLR05G102G	"	1K	"	"	4.0	3.2%										

FOR USE OF RELIABILITY DEPT.

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .003022 %/1000 HRS

BS-321A

RESISTORS

PROJECT: LSG
ASSEMBLY: Board #15
SUB ASSEMBLY: Instrument Housing / Temperature Control
DATE: 1/10/70
SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RLR07C100G	Corning	10	±2	1/4	2.4	1%	1	50		.275	A		.001			.00027
R2	"	"	"	"	"	2.4	1%				.275						.00027
R3	TBD	MEPCO	2.21K	±1	1/10	2.2	2.2%				.275						.00027
R4	RND55E2552F	"															
R5	TBD	"															
R8	RNR55E1003F	"	100K	±1	1/10	.25	< 1%				.178						.00018
R9	"	"	"	"	"	.25	< 1%				.178						.00018
R10	TBD	"															.00027
R13	RNR65E1004FR	"	1M	±1	1/4	< 1	< 1%				.178						.00018
R15	"	"	"	"	1/4	< 1	< 1%				.178						.00018
R14	RLR07C273GR	"	27K	±2	1/4	.69	< 1%										
R16	RLR07C104GR	"	100K	±2	1/4	< 1	< 1%										
R17	RLR076682GR	"	68K	"	1/4	4.35	1.5%										
R26	"	"	"	"	1/4	4.35	1.5%										
R18	RLR07C512GR	"	5.1K	"	1/4	4.9	2%										
R19	RLR07C333GR	"	33K	"	1/4	< 1	1%										
R20	"	"	"	"	1/4	< 1	1%										

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE: .00423 %/1000 HRS

BS-321A

RESISTORS

PROJECT: LSG
ASSEMBLY: Board #15
SUB ASSEMBLY: Instrument Housing / Temperature Control
DATE: 1/10/71
SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	12 SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DESIGNS)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	16 TOTAL RESISTOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)
R22	RLR07C103GR	MEPCO	10K	±2	1/4	2.5	1%	1	50		.275	A			.001			.00027
R23	"	"	"	"	1/4	2.5	1%	1	50			A			.001			.00027
R24	"	"	"	"	1/4	2.5	1%	1	50			A			.001			.00027
R6	RNR55E2431F		2.43K	±1	1/10	1.55	1.55%	1	50		.178	A			.001			.00018
R7	RLR07C302G	MEPCO	3K	±2	1/4	1.47	< 1%	1	50		.275	A			.001			.00027
R21	"	"	"	"	"	1.47	< 1%	1	50		.275	A			.001			.00027

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .00153 %/1000 HRS

BS-321A

PARTS [illegible]CATION ANALYSIS

RESISTORS

PROJECT: LSG

ASSEMBLY: Power Converter Fwd. SUB ASSEMBLY: Power Converter

DATE: 1/10/71

SCHEMATIC NO:

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO (OPERATING/RATED)	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DESIGNS)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R5	RNR55E1963F	MEPCO	196K	±1	1/10	2.45	2.45%	1	50		.178	A		.001			.00018
R7	TBD	MEPCO															.00018
R	TBD	"															.000022
R2	RLR07C123G		12K	±2	1/4	1.92	<1%				.275						.00027
R8	RLR07C223G		22K	"	"	10.78	4.3%				.275						.00027
R9	RCR07G335J		3.34	±5	"	<1	<1%				.022						.000022
R10	RNR55E3740F		374	±1	1/10	5.0	5%				.178						.00018
R11	RNR55E698F		69.8K	"	"	6.0	6%										
R6	RNR55E1473F		147K	"	"	1.47	1.47%										
R12	RLR07C510G		51	±2	1/4	5.0	2%				.275						.00027
R1	RLR07C152G		1.5K	"	"	13.5	5%										
R13	RLR07C472G		4.7K	"	"	12.0	4.9%										
R3	RLR07C103G		10K	"	"	2.5	1%										
R14	RLR07C113G		11K	"	"	2.4	1%										

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .002834 %/1000 HRS

BS-321A

RESISTORS

(Resistors)

PROJECT: LSG DATE: 1/10/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Stabilized Oscillator SCHEMATIC NO:

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) @ Δ°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R8	RCR07G472JS	Allen Bradley	4.7K	±5	1/4	4.7	1.8%	1	50		.022	A		.001			.000022
R15	RCR07G103JS	" "	10K	"	"	2.5	1%										
R16	RCR07G333JS	" "	33K	"	"	.84	< 1%										
R7	RCR07G224JS	" "	220K	"	"	< 1	< 1%										
R8	RCR07G475JS	" "	4.7K	"	"	< 1	< 1%										
R5	RCR07G106JS	" "	10M	"	"	< 1	< 1%										
R6	RNR55E4751F	MEPCO	4.75K	±1	1/10	4.75	4.75%				.178						.00018
R12	RNR55E1022F	"	10.2K	"	1/10	2.45	2.45%										
R13	"	"	"	"		2.45	2.45%										
R4	RNR55E2212F	"	22.1K	"		1.17	1.17%										
R11	"	"	"	"		1.17	1.17%										
R1	RNR55E2742JR	"	27.4K	"		< 1	1.1%										
R12	RNR55E4752JR	"	47.5K	"		< 1	< 1%										
R2	RCR07G226JS	Allen Bradley	22M	±5	1/4	< 1	< 1%				.022						.000022
R3	RNRL5C2233FR	MEPCO	221K	±1	1/10	< 1	< 1%				.178						.00018

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .001594 %/1000 HRS

FORM 9251
BS-321A

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #8

SUB ASSEMBLY: Integrator

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN %	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See Below)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
U1	Op. Ampl. 1402-02	Philbrick	Linear	50	85	55	±24		±4				70			Operational Amplifier		A			.0064

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0064 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #7

SUB ASSEMBLY: Seismic Ampl & Filter

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C			VOLTAGES			INPUTS		OUTPUTS		SPEED	CLOCK WIDTH	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY				
				AMBIENT ACTUAL	JUNCTION RATED	JUNCTION ACTUAL	DERATED MAXIMUM	ACTUAL	DERATED MINIMUM	FAN IN %	% OF MAX I OR V	FAN OUT %	LOADING %	% OF MAX	MIN / ACTUAL %		RATE (%/ 1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A1	Op. Ampl. LM108AH/883	Nat. Semi.	Linear	50	125	60	±20	±10	±2				60			Op. Ampl.		A			.0020
A3	Op. Ampl. LM108AH/883	Nat. Semi.	Linear	50	125	60	±20	±10	±2				60			Op. Ampl.		A			.0020
A2	Op. Ampl. 1402-02	Philbrick	Linear	50	85	55	±24	±10	±4				70			Op. Ampl.		A			.0064

22 FAILURE RATE SOURCE (See Column 19)

A ATM 605A

B

C

D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

26 TOTAL FAILURE RATE .0104 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #6

SUB ASSEMBLY: Mass Change Servo

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: SOURCE (See Note)	FOR RELIABILITY USE ONLY: FAIL. RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I1	LPT2L Gate SNA54L00	TI	Logic	50	125	60	5.3	5	4.7			50				Gate		A			.0020
I2	LPT2L F.F. SNA54L78	TI	Logic	50	125	60	5.3	5	4.7			70				Flip Flop		A			.0020
I3	LPT2L F.F. SNA54L78	TI	Logic	50	125	60	5.3	5	4.7			70				Flip Flop		A			.0020

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5(V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0060 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

DATE: 1/15/71

ASSEMBLY: Board #4 & 5

SUB ASSEMBLY: Screw Servo

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See footnote)	FAILURE RATE	MULTIPLIER	TOTAL QUANT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
	LPT2L Gate SNA54L00	TI	Logic	50	125	60	5.30	5.0	4.7			50				Gate		A				.0080
	LPT2L Gate SNA54L10	TI	Logic	50	125	60	5.30	5.0	4.7			60				Gate		A				.0040
	LPT2L Gate SNA54L20	TI	Logic	50	125	60	5.30	5.0	4.7			60				Gate		A				.0020
	LPT2L Gate SNA54L51	TI	Logic	50	125	60	5.30	5.0	4.7			50				Gate		A				.0020
	LPT2L F.F. SNA54L72	TI	Logic	50	125	60	5.30	5.0	4.7			70				Flip Flop		A				.0020
	LPT2L F.F. SNA54L78	TI	Logic	50	125	60	5.30	5.0	4.7			60				Flip Flop		A				.0020
	LPT2L Coutr. SNA54L93	TI	Logic	50	125	60	5.30	5.0	4.7			50				Counter		A				.0080
	S8J80J	Sig-netics	Logic	50	125	60	6.0					60				Nand Interface Gate		A				.0020

FAILURE RATE SOURCE (See Column 19)

A ATM 605A

B

C

D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .0240 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #10

SUB ASSEMBLY: Shaft Encoder Elect.

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C				VOLTAGES			INPUTS		OUTPUTS		SPEED	CLOCK WIDTH	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY				
				AMBIENT ACTUAL	JUNCTION RATED	JUNCTION ACTUAL		DERATED MAXIMUM	ACTUAL	DERATED MINIMUM	FAN IN %	% OF MAX I OR V	FAN OUT %	LOADING %	% OF MAX	MIN / ACTUAL %		RATE (%/ 1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7		8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I27	T2L Inv. SNA54L04	TI	Dig	50	125	60		5.3	5	4.7			50				Inverter		A			.0080
thru I31	T2L Inv. SNA54L04	TI		50	125			5.3	5	4.7			60				Inverter		A			
I26	T2L JK F.F. SNA54L73	TI		50	125			5.3	5	4.7			70				J-K Flip Flop		A			.0020
I25	T2L Gate SNA54L20	TI		50	125			5.3	5	4.7			60				Gate		A			.0020
I6	T2L Gate SNA54L10	TI		50	125			5.3	5	4.7			60				Gate		A			.0360
thru I24	T2L Gate SNA54L10	TI		50	125			5.3	5	4.7			60				Gate		A			
I1	T2L Gate SNA54L51	TI		50	125			5.3	5	4.7			60				Gate		A			.0080
thru I5	T2L Gate SNA54L51	TI		50	125			5.3	5	4.7			60				Gate		A			
I31	LPT2L F.F. SNA54L78	TI		50	125			5.3	5	4.7			60				Flip Flop		A			.0020

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0580 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #15

SUB ASSEMBLY: Inst. Housing Temp. Control

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C			VOLTAGES			INPUTS		OUTPUTS		SPEED	CLOCK WIDTH	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY				
				AMBIENT ACTUAL	JUNCTION RATED	JUNCTION ACTUAL	MAXIMUM DERATED	ACTUAL	MINIMUM DERATED	FAN IN %	% OF MAX I OR V	FAN OUT %	LOADING %	% OF MAX	MIN ACTUAL %		RATE (%/ 1000 HRS)	SOURCE (See Column 19)	FAIL. RATE	MULTIPLIER	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I3	Voltage Ref. LM103-5.1/883	Nat. Semi.	Lin-ear	50	125	60	>5	5	4				70			Voltage Regulator		A			.0020
I4	Voltage Ref. LM103-5.1/883	Nat. Semi.	Lin-ear	50	125	60	>5	5	4				70			Voltage Regulator		A			.0020
I7	Voltage Ref. LM103-5.1/883	Nat. Semi	Lin-ear	50	125	60	>5	5	4				60			Voltage Regulator		A			.0020
I1	Voltage Regul. SM105 G	Nat. Semi	Lin-ear	50	150	60	50	20	8.5				60			Voltage Regulator		A			.0020
I2	Voltage Regul. SM105 G	Nat. Semi	Lin-ear	50	150	60	50	20	8.5				60			Voltage Regulator		A			.0020
A1	Op. Ampl. NH0001AH/883	Nat. Semi	Lin-ear	50	125	60	≤±20	10	±5≤				70			Op. Amplifier		A			.0020
A2	Op. Ampl. NH0001AH/883	Nat. Semi	Lin-ear	50	125	60	≤±20	10	±5≤				70			Op. Amplifier		A			.0020
I10	Voltage Ref. LM103-2.4/883	Nat. Semi	Lin-ear	50	125	60	>5	5	4				60			Voltage Reference		A			.0020
I11	Voltage Ref. LM103-2.4/883	Nat. Semi	Lin-ear	50	125	60	>5	5	4				60			Voltage Reference		A			.0020

FAILURE RATE SOURCE (See Column 19)

A ATM 605A C

B D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .0180 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

DATE: 1/15/71

ASSEMBLY: Board #1

SUB ASSEMBLY: Digital MUX

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE	FAILURE RATE MULTIPLIER	TOTAL FAILURE RATE PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
I1	Shift Register SNA54L95	TI	Logic	50	125	60	5.3	5.0	4.7			50				Register		A			.0020
I2	Shift Register SNA54L95	TI	Logic	50	125	60	5.3	5.0	4.7			60				Register		A			.0020
I3	Shift Register SNA54L95	TI	Logic	50	125	60	5.3	5.0	4.7			50				Register		A			.0020
I4	T2L Gate SNA54L54	TI	Logic C	50	125	60	5.3	5.0	4.7			50				Gate		A			.0180
thru I13	T2L Gate SNA54L54	TI	Logic	50	125	60	5.3	5.0	4.7			50				Gate		A			

FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .0240 %/1000 HRS

B&A 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #1

SUB ASSEMBLY: Digital MUX Control

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	INPUTS: FAN IN %	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See Column 19)	FAILURE RATE MULTIPLIER	TOTAL FAILURE RATE PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I5	T2L Gate SN54L00	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I4	INV T2L SN54L04	TI	Logic	50	125	60	5.3	5	4.7			60				Inverter		A			.0020
I6	INV T2L SN54L04	TI	Logic	50	125	60	5.3	5	4.7			60				Inverter		A			.0020
I3	T2L Gate SN54L10	TI	Logic C	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I2	T2L Gate SN54L20	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I1	SN54L93	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .8 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .8 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0120 %/1000 HRS

BuA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #2

SUB ASSEMBLY: Command Decoder & Drives

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	6	8	7	9	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I1	T2L Hex Driver S8T90J	Sig-netics	Logic	50	125	60	6					50				Hex Inverter Interface		A			.0020
I2	T2L Hex Driver S8T90J	Sig-netics	Logic	50	125	60						50				Hex Inverter Interface		A			.0020
I3	T2L INV SNA54L04	TI	Logic	50	125	60	5.3	5.0	4.7			60				~~Inverter Interface~~		A			.0020
I4	T2L INV SNA54L04	TI	Logic	50	125	60	5.3	5.0	4.7			60				~~Inverter Interface~~		A			.0020
I5	T2L Decoder UAM93L1151X	Fair-child	Logic	50	125	60	7.0	3.5	0.5			60				Decoder		A			.0020

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0100 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #2

SUB ASSEMBLY: Command Counter

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL ACTUAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I1	T2L SNA54L86	TI	Logic	50	125	60	5.3	5	4.7			50				Flip Flop		A			.0020
I2	T2L F.F. SNA54L78	TI	Logic	50	125	60	5.3	5	4.7			60				Flip Flop		A			.0020
I3	T2L F.F. SNA54L78	TI	Logic	50	125	60	5.3	5	4.7			60				Flip Flop		A			.0020
I4	T2L F.F. SNA54LT2	TI	Logic	50	125	60	5.3	5	4.7			60				Flip Flop		A			.0020
I5	T2L Gate SNA54L00	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I6	T2L Gate SNA54L00	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I7	T2L Gate SNA54L00	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0140 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #7

SUB ASSEMBLY: Free Modes Filter

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A1	Op. Ampl. 1402-02	Phil-brick	Lin-ear	50	85	55	±24	±10	±4				70			Oper-ational Amplifier		A			.0064

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6(V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0064 %/1000 HRS

BxA 679

PARTS APPLICATIO? ·ALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #8 SUB ASSEMBLY: Post-Ampl.

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT	OUTPUTS: LOADING %	SPEED % OF MAX	CLOCK WIDTH MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: SOURCE (See below)	FOR RELIABILITY USE ONLY: FAILURE RATE	FOR RELIABILITY USE ONLY: MULTIPLIER	FOR RELIABILITY USE ONLY: TOTAL QUANTITY PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
A_1	Op. Ampl. SM101G-1	85M0 3910	Lin-ear	50	85	55	±24	±10	±4				70			Op. Amplifier		A			.0064	
VR_1	Voltage Reg. LM103-5.1	Nat. Sem.	Lin-ear	50	125	60	>5	5	4				70			Voltage Regulator		A			.0080	
UR_4	Voltage Reg. LM103-5.1	Nat. Sem.	Lin-ear	50	125	60	>5	5	4				60			Voltage Regulator		A			.0080	
I_4	Analog Gate CDA2-3	Crys-talonics	Lin-ear	50												Analog Gate		A			.0064	
I_5	Analog Gate CDA2-3	Crys-talonics	Lin-ear	50												Analog Gate		A			.0064	
I_1	LP/T^2L Gate SNA54L 30	TI	Log-ic	50	125	60	5.3	5	4.7				50			Gate		A			.0020	
I_2	LP/T^2L F.F SNA54L78	TI	Log-ic	50	125	60	5.3	5	4.7				50			Flip Flop		A			.0020	
I_3	LP/T^2L F.F SNA54 78	TI	Log-ic	50	125	60	5.3	5	4.7				50			Flip Flop		A			.0020	

22 FAILURE RATE SOURCE (See Column 19)
A ATM 605A C
B D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0412 %/1000 HRS

B&A 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #4

SUB ASSEMBLY: Tilt Servo

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See notes)	FAILURE RATE MULTIPLIER	TOTAL FAILURE RATE PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I 8	ST80J	Sig-netics	Dig	50	125	60	6.0					60				Nand Interface Gate		A			.0020

23 FAILURE RATE SOURCE (See Column 19)

A ATM 605 A C

B D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0020 %/1000 HRS

9xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #4 SUB ASSEMBLY: Tilt Servo

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C			VOLTAGES			INPUTS		OUTPUTS		SPEED	CLOCK WIDTH	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY				
				ACTUAL AMBIENT	RATED JUNCTION	ACTUAL JUNCTION	DERATED MAXIMUM	ACTUAL	DERATED MINIMUM	FAN IN %	% OF MAX I OR V	FAN OUT %	LOADING %	% OF MAX	MIN / ACTUAL %		RATE (%/ 1000 HRS)	SOURCE (See below)	FAIL RATE	MULTIPLIER	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I_1	LPT^{2}L Gate SNA54L00	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I_4	LPT^{2}L Gate SNA54L00	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I_6	LPT^{2}L Gate SNA54L00	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I_7	LPT^{2}L Gate SNA54L00	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I_9	LPT^{2}L Gate SNA54L00	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I_{10}	LPT^{2}L Gate SNA54L00	TI	Logic	50	125	60	5.3	5	4.7			60				Gate		A			.0020
I_3	LPT^{2}L F.F. SNA54L72	TI	Logic	50	125	60	5.3	5	4.7			50				Flip Flop		A			.0020
I_5	LPT^{2}L F.F SNA54L78	TI	Logic	50	125	60	5.3	5	4.7			50				Flip Flop		A			.0020
I_2	LPT^{2}L Control SN54L93	TI	Logic	50	125	60	5.3	5	4.7			50				Controller		A			.0020

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605 A C
B D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0180 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #15 SUB ASSEMBLY: Temp. Monitor

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A_1	Op. Amp. NH0001AH/883	Nat. Semi	Linear	50	125	60	≤+20	10	±5≤				70			Op. Amp		A			.0020
I_5	Volt Reference LMID3-4.3/883	"	"	50	125	60	>5	5	4				60			Voltage Ref.		A			.0020
I_6	Volt Reference LMID3-4.3/883	"	"	50	125	60	>5	5	4				60			Voltage Ref.		A			.0020

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0060 %/1000 HRS

BuA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #2 SUB ASSEMBLY: Dig.

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	INPUTS: FAN IN %	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	FOR RELIABILITY USE ONLY: SOURCE	FOR RELIABILITY USE ONLY: FAIL. RATE MULTIPLIER	FOR RELIABILITY USE ONLY: TCOUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I_5	S8T90J	Sig-netics	Dig.	50	125	60	6.0					70				Hex inverter Interface		A			.0020
I_1	SNA54L04	TI	Dig.	50	125	60	5.3	5	4.7			60				Hex inverter Interface		A			.0020
I_2	SNA54L04	TI	Dig.	50	125	60	5.3	5	4.7			60				Hex inverter Interface		A			.0020
I_3	SNA54L04	TI	Dig.	50	125	60	5.3	5	4.7			60				Hex inverter Interface		A			.0020
I_4	SNA54L04	TI	Dig.	50	125	60	5.3	5	4.7			60				Hex inverter Interface		A			.0020

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A C
B D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0100 %/1000 HRS

BxA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board # 1 & 9

A

SUB ASSEMBLY: H/D Converters

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: AMBIENT ACTUAL	MAX TEMP °C: JUNCTION RATED	MAX TEMP °C: JUNCTION ACTUAL	VOLTAGES: MAXIMUM DERATED	VOLTAGES: ACTUAL	VOLTAGES: MINIMUM DERATED	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
I_1	T^2L F.F. SNA54L73	TI	Log	50	125	60	5.3	5	4.7			50				Flip Flop		A			.0100
thru I_5	T^2L F.F. SNA54L73	TI	Log	50	125	60	5.3	5	4.7			60				Flip Flop		A			
I_6	T^2L Gate SNA54L00	TI	Log	50	125	60	5.3	5	4.7			60				Gate		A			.0100
thru I_{11}	T^2L Gate SNA54L00	TI	Log	50	125	60	5.3	5	4.7			60				Gate		A			
I_{12}	Analog Switch CDA2-1	Crys-talonic	Linear	50									70					A			.0256 ~~.0064~~
thru I_{16}	Analog Switch CDA2-1	Crys-talonics	Linear	50									70					A			~~.0064~~
A_1	Op. Amp. NH0001AH/883	Nat Semi	Linear	50	125	60	≤ ±20	10	±5 ≤				60			Op. Amp.		A			.0100
thru A_5	Op. Amp. NH0001AH/883	Nat Semi	Linear	50	125	60	≤ ±20	10	±5 ≤				60			Op. Amp.		A			
~~thru~~ D_5	Voltage Reg. LM103-5. 1/883	Nat Semi	Linear	50	125	60	>5	5	4				60			Voltage Reg.		A			.0020

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .5 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .5 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0448 ~~.0664~~ %/1000 HRS

B&A 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #3 SUB ASSEMBLY: Analog Output Buffer

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED % OF MAX	CLOCK WIDTH MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See Below)	FAILURE RATE MULTIPLIER	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
I_1	Op. Amp NH0001AH/883	Nat Semi	Linear	50	125	60	≤±20	±10	±5≤				70			Op. Amp.		A			.0140
thru I_7	Op. Amp. NH0001AH/883	Nat Semi	Linear	50	125	60	≤±20	±10	±5≤				70			Op. Amp.		A			~~.0140~~

FAILURE RATE SOURCE (See Column 19)

A ATM 605A C

B D

NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6(V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6(V_{NOM} - V_{RATED\ MIN})$

TOTAL FAILURE RATE .0140 %/1000 HRS

8xA 679

PARTS APPLICATION ANALYSIS

(MICROCIRCUITS)

PROJECT: LSG

ASSEMBLY: Board #3

SUB ASSEMBLY: Analog MUX

DATE: 1/15/71

SCHEMATIC NO:

(Microcircuits)

CKT SYM NO.	TYPE DESIGNATION	MANUFACTURER	TYPE	MAX TEMP °C: ACTUAL AMBIENT	MAX TEMP °C: RATED JUNCTION	MAX TEMP °C: ACTUAL JUNCTION	VOLTAGES: DERATED MAXIMUM	VOLTAGES: ACTUAL	VOLTAGES: DERATED MINIMUM	INPUTS: FAN IN %	INPUTS: % OF MAX I OR V	OUTPUTS: FAN OUT %	OUTPUTS: LOADING %	SPEED: % OF MAX	CLOCK WIDTH: MIN / ACTUAL %	CIRCUIT FUNCTION OR APPLICATION	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See Column 19)	FAILURE RATE MULTIPLIER	TOTAL PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
I_3	T^2L Gate SNA54L00	TI	Log	50	125	60	5.3	5	4.7			70				Gate		A			.0020
I_4	T^2L Shift Right SNA54L95	TI	Log	50	125	60	5.3	5	4.7			60				Shift Register		A			.0020
I_5	T^2L Shift Right SNA54L95	TI	Log	50	125	60	5.3	5	4.7			60				Shift Register		A			.0020
I_6	Op. Amp. NH0001AH/883	Nat Semi	Linear	50	125	60	$\leq \pm 20$	± 10	$\pm 5 \leq$				70			Op. Amp.		A			.0020
I_2	Translator VA1026	United Air-craft	Logic	50	125	60	5.3	5	4.7			50				Voltage Translator		A			.0020
I_1	Multiplex Gate MEM2009	Gen. Inst.	Logic	50	125	60	5.3	5	4.7			60				Multiplex Gate		A			.0020

23 FAILURE RATE SOURCE (See Column 19)
A ATM 605A
B
C
D

24 NOTE: DERATED VOLTAGE IS DETERMINED BY:
$V_{MAX} = V_{NOM} + .6 (V_{RATED\ MAX} - V_{NOM})$
$V_{MIN} = V_{NOM} - .6 (V_{NOM} - V_{RATED\ MIN})$

25 TOTAL FAILURE RATE .0120 %/1000 HRS

8xA 679

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #8 SUBASSEMBLY: Stabilized Oscillator SCHEMATIC NO:

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value mfd	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage Ratio, Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (λ_b /1000 Hrs) At 35°C (See Below)	13 For Use of Reliability Dept.	14 Special Environment (See Below)	15 Failure Rate Multiplier	16 Final Failure Rate	17 Total Capacitor Count Per Type	18 Total Failure Rate (λ/1000 Hrs)
C_1	ECY103ROC5	Corning	3PF	$\pm .25$ PF	500	40		8%	1	50	Glass	A		.01				.0004
C_2	CKR05BX102K	Aerovox	.001	±10	200	30		15%			Ceramic							.0005
C_3	CKR06BX105K	Aerovox	1.0	±10	50	15		30%			Ceramic							.0005
C_4	CKR06 BX104K	Aerovox	0.1	±10	50	5		10%			Ceramic							.0005
C_5	HGI-472A	Marshall	4700 PF	± 1	100	20		20%			Polycarbon							.0005
C_6	HGI-472A	Marshall	4700 PF	±1	100	15		15%			Polycarbon							.0005
C_8	CKR05BX220K	Aerovox	22 PF	±10	200	30		15%			Ceramic							.0005
C_7	CKR05BX370K	Aerovox	39 PF	±10	200	20		10%			Ceramic							.0005
C_9	TBD								↓	↓	Ceramic			↓				.0005
C_{10}	TBD								1	50	Ceramic	A		.01				.0005

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF ____ HRS

22 TOTAL FAILURE RATE .00454 /1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #8 SUBASSEMBLY: Demodulator SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OF MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO: OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% (SEE BELOW)	13 SOURCE	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)	19
C_{17}	CKR06BX103K	Aerovox	0.01	±10	50	15		30%	1	50	Ceramic		A		.01				.0005
C_1	CKR06BX105K	Aerovox	1.0	±10	50	15		30%	1	50	Ceramic								
C_2	CKR06BX105K	Aerovox	1.0	±10	50	5		10%	1	50	Ceramic								
C_4	TBD									50	Ceramic		A		.01				.0005

FOR USE OF RELIABILITY DEPT.

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0020 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #3 SUBASSEMBLY: Analog Mux SCHEMATIC NO: LGE-D4 2362312

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (% /1000 HRS) AT 50°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (% /1000 HRS)	19 FOR USE OF RELIABILITY DEPT.
C_2	CKR11BX222K		22 PF	±10	200	50	-	25%	1	50	Lag Compensation		A	.01				.0005	
C_1	CKR12BX390K		39 PF	±10	200	50	-	25%			Lag Compensation								
C_3	CKR06BX105K		1.0	±10	50	15	-	30%			Decoupling								
C_4	CKR06BX105K		1.0	±10	50	15	-	30%			Decoupling								
C_5	CKR06BX105K		1.0	±10	50	15	-	30%	1	50	Decoupling		A	.01				.0005	

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0025 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG
ASSEMBLY: Board #2 SUBASSEMBLY: Command Counter
DATE: 1/5/71
SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	4 TOLERANCE %	5 MANUFACTURER'S RATED VOLTAGE	6 OPERATING VOLTAGE DC	6 OPERATING VOLTAGE PEAK AC	7 VOLTAGE RATIO, OPERATING/ RATED	8 MAXIMUM DUTY CYCLE	9 BULK AIR TEMPERATURE (°C)	10 CIRCUIT FUNCTION OR APPLICATION	11 BASIC FAILURE RATE (%/1000 HRS) AT 50% C.L. (SEE BELOW)	12 SOURCE	13 SPECIAL ENVIRONMENT (DISTRB)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)
C1	CKR06BX105K	Aerovox	1.0	±10	50	10		20%	1	50		A		.01				.0005

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0005 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #2 SUBASSEMBLY: Command Decoder and Drive SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50°C (USE SECTION 5 BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C_1	CKR06BX105K	KIL-C-39014	1.0	±10	50	15		30%	1	50		A		.01				.0005

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0005 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #1 SUBASSEMBLY: Dig. Mux Control SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	8 OPERATING VOLTAGE PEAK AC	9 VOLTAGE RATIO, OPERATING/ RATED	10 MAXIMUM DUTY CYCLE	11 BULK AIR TEMPERATURE (°C)	12 CIRCUIT FUNCTION OR APPLICATION	13 BASIC FAILURE RATE (%/1000 HRS) AT 25°C (SEE BELOW)	14 FOR USE OF RELIABILITY DEPT.	15 SPECIAL ENVIRONMENT (DEFINE)	16 FAILURE RATE MULTIPLIER	17 FINAL FAILURE RATE	18 TOTAL CAPACITOR COUNT PER TYPE	19 TOTAL FAILURE RATE (%/1000 HRS)
C_1	CKR06BX105K		1.0	±10	50	10		20%	1	50		A		.01				.0005
C_2	CKR05BX221K		220 PF	±10	200	10		8%	1	50		A		.01				.0005

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0010 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #1 SUBASSEMBLY: Dig. Mux SCHEMATIC NO: 2362304

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT ___°C	13 SCORE (SEE BELOW)	14 SPECIAL ENVIRONMENT (DESIGN)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C_1	CKR06BX105K	MIL-C-39014	1.0	+10	50	10		20%	1	50	Decoupling	A		.01				.0005

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B _____
C _____ D _____

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0005 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #3 SUBASSEMBLY: Analog Output Buffer SCHEMATIC NO: 2362312

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value mfd	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage Ratio: Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (% / 1000 Hrs)	13 To Obtain Δ T °C (See Below)	14 Special Environment (Destins)	15 Failure Rate Multiplier	16 Final Failure Rate	17 Total Capacitor Count Per Type	18 Total Failure Rate (% / 1000 Hrs)
C_5	CKR06BX154K	Aerovox	0.15	±10	50	3.6	-	7%	1	50	Feedback Filter	A		.01				.0005
C_1	CKR06BX103K	Aerovox	0.01	±10		3.2	-	6%			Feedback Filter							
C_2	CKR06BX103K	Aerovox	↓	±10	↓	↓	-	↓	↓	↓	Feedback Filter			↓				↓
C_3	CKR06BX103K	Aerovox	↓	±10	↓	↓	-	↓	↓	↓	Feedback Filter			↓				↓
C_4	CKR06BX103K	Aerovox	0.01	±10	50	3.2	-	6%	1	50	Feedback Filter	A		.01				.0005

FOR USE OF RELIABILITY DEPT. ONLY

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B _____
C _____ D _____

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0025 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #3 SUBASSEMBLY: Analog Output Buffer SCHEMATIC NO: 2362312

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value mfd	4 Tolerance %	5 Manufacturer's Rated Voltage	6 Operating Voltage DC	6 Operating Voltage Peak AC	7 Voltage Ratio Operating/Rated	8 Maximum Duty Cycle	9 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 HRS)	13 Sources (See Below)	14 Special Environment (Defend)	15 Failure Rate Multiplier	16 Final Failure Rate	17 Total Capacitor Count Per Type	18 Total Failure Rate (%/1000 HRS)
C_{20}	CKR06BX105K	Aerovox	1.0	±10	50	15	-	30%	1	50	Decoupling		A		.01			.0005
C_{21}	CKR06BX105K	Aerovox	↓	↓	↓	5	-	10%	↓	↓	↓							↓
C_{22}	CKR06BX105K	Aerovox	1.0		50	15	-	30%			Decoupling							
C_6	CKR11BX220K	Aerovox	22 PF		200	20		10%			Lag Compensation							
C_7	CKR11BX220K	Aerovox	↓		↓	↓		↓			↓							
C_8	CKR11BX220K	Aerovox																
C_9	CKR11BX220K	Aerovox																
C_{19}	CKR11BX220K	Aerovox																
C_{11}	CKR11BX220K	Aerovox	↓															
C_{12}	CKR11BX220K	Aerovox	22 PF															
C_{13}	CKR12BX390K	Aerovox	39 PF															
C_{14}	CKR12BX390K	Aerovox	↓															
C_{15}	CKR12BX390K	Aerovox																
C_{16}	CKR12BX390K	Aerovox																
C_{17}	CKR12BX390K	Aerovox																
C_{18}	CKR12BX390K	Aerovox	↓	↓	↓	↓		↓	↓	↓	↓				↓			↓
C_{19}	CKR12BX390K	Aerovox	39 PF	±10	200	20		10%	1	50	Lag Compensation		A		.01			.0005

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605A B

C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0085 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #1 and #9 SUBASSEMBLY: A/D Converter SCHEMATIC NO: 2362300

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO (OPERATING/RATED)	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (% /1000 HRS) AT 50°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (% /1000 HRS)
C_{21}	CKR06BX105K	Aerovox	1.0	±10	50	15		30%	1	50	Decoupling		A	.01				.0005
C_1	CKR11BX220K		22 PF		200	20		10%			Lag Compensation							
C_4	CKR11BX220K																	
C_6	CKR11BX220K																	
C_7	CKR11BX220K																	
C_{11}	CKR11BX220K		22 PF															
C_2	CKR12BX390K		39 PF															
C_3	CKR12BX390K																	
C_5	CKR12BX390K																	
C_{10}	CKR12BX390K																	
C_{12}	CKR12BX390K		39 PF		200	20		10%			Lag Compensation							
C_8	CKR06BX105K		1.0		50	15	-	30%			Decoupling							
C_{13}	CKR06BX105K					5	-	10%										
C_{14}	CKR06BX105K					5	-	10%										
C_{15}	CKR06BX105K	Aerovox	1.0	±10	50	5	-	10%	1	50	Decoupling		A	.01				.0005

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0075 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #2 SUBASSEMBLY: Dig. Time Buffers & Receivers SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (% / 1000 HRS) AT 50% STRESS AND 40°C (SEE BELOW)	13 SPECIAL ENVIRONMENT (DESIGN)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (% / 1000 HRS)
C_3	CKR06BX105K	MIL-C-39014	1.0	±10	50	15		30%	1	50	Ceramic	A		.01			.0005
C_4	CKR06BX105K	MIL-C-39014	1.0	±10	50	5		10%			Ceramic						.0005
C_1	TBD										Ceramic						.0005
C_2	CSR 13		15	±10	20	5		25%			Solid tant						.00018
C_5	CSR 13		15	+10	20	5		25%	1	50	Solid tant	A		.01			.00018

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .00186 % / 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: LSG

DATE: 1/5/71

ASSEMBLY: Board #15

SUBASSEMBLY: Temp. Monitor

SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (% / 1000 HRS) AT 25°C (SOURCE SEE BELOW)	13 SPECIAL ENVIRONMENT (DEFINE)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (% / 1000 HRS)
C_3	CKR05BX390K		39 PF	±10	200	30		15%	1	50		A	.01				.0005
C_4	CKR053X22012		22 PF		200	20		10%									
C_5	CKR06BX103K		.01		50	15		30%									
C_1	CKR06BX104K		1.0		50	15		30%									
C_2	CKR06BX104K		1.0	±10	50	5		10%	1	50		A	.01				.0005

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0025 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #4 SUBASSEMBLY: Tilt Servo SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE P&A AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C (SEE BELOW)	13 SOURCE	14 SPECIAL ENVIRONMENT (DESCRIBE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C_1	CKR06BX105K	Aerovox	1.0	±10	50	15		30%	1	50		A		.01				.0005
C_2	CKR06BX105K	Aerovox	1.0	±10	50	5		10%	1	50		A		.01				.0005
C_3	CKR06BX105K	Aerovox	1.0	±10	50	15		30%	1	50		A		.01				.0005

FOR USE OF RELIABILITY DEPT.

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0015 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: LSG

ASSEMBLY: Board #13 SUBASSEMBLY: Fixed Gain Pre-amp

DATE: 1/5/71

SCHEMATIC NO:

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value and/or	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage Ratio, Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) AC / DC / Source (See Below)	13 Special Environment (Destine)	14 Failure Rate Multiplier	15 Final Failure Rate	16 Total Capacitor Count Per Type	17 Total Failure Rate (%/1000 Hrs)
C2	CKR06BX105K	Aerovox	1.0	±10	50	15		30%	1	50		A	.01				.0005
C3	"	"	"	"		5		10%									
C4	"	"	"	"		15		30%									
C5	"	"	"	"		15		"									
C6	CKR05BX101K	"	100PF	"	200	30		15%									
C1	CKR06BX103K	"	.01	"	50	5		10%	1	50		A	.01				.0005

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)
ATM 605A
A _____ B _____
C _____ D _____

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0030 %/1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #8 SUBASSEMBLY: Post Ampl. SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (% / 1000 HRS) AT 25°C (SOURCE BELOW)	13 SPECIAL ENVIRONMENT (DEFINE)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (% / 1000 HRS)
C_1	CKR06BX105K	Aerovox	1.0	±10	50	5		10%	1	50		A	.01				.0005
C_2	CKR06BX105K					15		30%									
C_3	CKR06BX105K					15		30%									
C_4	CKR06BX105K					15		30%									
C_5	CKR06BX105K					5		10%									
C_6	CKR06BX105K					5		10%									
C_7	CKR06BX105K					15		30%									
C_8	CKR06BX105K		1.0		50	15		30%									
C_9	CKR05BX100K		10 PF		200	30		15%									
C10	CKR05BX100K	Aerovox	22 PF	±10	200	20		10%	1	50		A	.01				.0005

FOR USE OF RELIABILITY DEPT. ONLY

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0050 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #7 SUBASSEMBLY: Free Modes Filter SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% C.L. (SEE BELOW)	13 SCURVE	14 SPECIAL ENVIRONMENT (DESTRUCT)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C_1	HL.5-106D	Marshall	10	±5	50	15		30%	1	50	Polycarbon	A		.01				.0005
C_2	HL.5-106D		10	±5		10		20%										
C_3	HL.5-106D		10	±5		10		20%										
C_4	HL.5-106D		10	±5		15		30%										
C_5	CKR06BX104	SPL	.1	±5		15		30%										
C_6	CKR06BX105K		1.0	±10		15		30%										
C_7	CKR06BX105K		1.0	±10		15		30%										
C_8	CKR06BX105K		1.0	±10		10		20%										
C_9	CKR06BX105K		1.0	±10	50	10		20%	1	50	Polycarbon	A		.01				.0005

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0045 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #8 SUBASSEMBLY: Stabilized Oscillator SCHEMATIC NO:

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value mfd	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	7 Operating Voltage Peak AC	8 Volt. of Ratio, Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) At 25°C (See Below)	13 Special Environment (Describe)	14 Failure Rate Multiplier	15 Final Failure Rate	16 Total Capacitor Count Per Type	17 Total Failure Rate (%/1000 Hrs)
C17	CKR06BX103K	Aerovox	.01	±10	50	15		30%	1	50		A		.01			.0005
C18	CKR06BX104K	Aerovox	.1	±10	50	15		30%									
C16	CKR06BX105K	Aerovox	1.0	±10	50	10		20%									
C15	CKR06BX104K	Aerovox	.1	±10	50	15		30%									
C14	TBD																
C13	TBD																
C12	TBD								1	50		A		.01			.0005

FOR USE OF RELIABILITY DEPT.

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0035 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #8 SUBASSEMBLY: Lute Grater SCHEMATIC NO:

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value mfd	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage Ratio: Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (% / 1000 Hrs) λb (Circuits (See Below))	13	14 Special Environment (Describe)	15 Failure Rate Multiplier	16 Final Failure Rate	17 Total Capacitor Count Per Type	18 Total Failure Rate (% / 1000 Hrs)
C1	HL-5-106-D	Marshall	10	+5	50	10		20%	1	50		A		.01				.0005

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0005 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #7 SUBASSEMBLY: Seismic Filter SCHEMATIC NO:

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil. or Mfr.) and Construction	3 Manufacturer	4 Capacitance Value mfd	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage/Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) at 50% Source (See Rev. 08)	13	14 Special Environment (See Rev.)	15 Failure Rate Multiplier	16 Final Failure Rate	17 Total Capacitor Count Per Type	18 Total Failure Rate (%/1000 Hrs)	19
C11	CKR05BX101K	Aerovox	100PF	±10	100	10		10%	1	50		A		.01				.0005	
C12	"	"	"	"	"														
C10	CKR06BX183K	"	.018	"	"	10													
C5	CKR06BX683K	"	.068	"	"	10													
C6	CKR06BX105K	"	1	"	50	5		10%											
C7	"	"	"	"	"	5													
C8	"	"	"	"	"	5													
C9	"	"	"	"	"	5													
C2	HL-5.105D	Marshall	1	±5	"	10		20%											
C1	HL-5.205D	"	2	"	"	10		20%											
C4																			
C3									1	50			A		.01			.0005	

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0060 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5171

ASSEMBLY: Board # 5 SUBASSEMBLY: Screo Servo SCHEMATIC NO:

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value mfd	5 Tolerance %	6 Manufacturer's Rated Voltage: Operating DC	6 Manufacturer's Rated Voltage: Operating Peak AC	7 Voltage	8 Voltage Ratio, Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) At 25°C (See Below)	13 Special Environment (Define)	14 Failure Rate Multiplier	15 Final Failure Rate	16 Total Capacitor Count Per Type	17 Total Failure Rate (%/1000 Hrs)
	CSR13D336K	Sprague	33	+10	15	3	20%	1	5D			A	.01				.000108
	CSR13H335K	↓	3.3	↓	75	5	6%	↓	↓			↓	↓				.000083
	CSR13B684KM	↓	6.8	↓	6	1	15%	↓	↓			↓	↓				.000108

FOR USE OF RELIABILITY DEPT.

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605A B _____

C _____ D _____

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .000299 %/1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #6 SUBASSEMBLY: Mass Changing Servo SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE MFD	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C, SCHEME (SEE BELOW)	13 SPECIAL ENVIRONMENT (DEFINE)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)
C5	CKR05BX220K	Aerovox	22PF	±10	200	15		7%	1	50		A		.01			.0005
C7	↓		↓														
C4	CKR05BX390K		39PF			15											
C6	↓		↓			10		5%									
C3	CKR06BX103K		.01		↓												
C1	CKR06BX105K		1		50	5		10%									
C2	↓		↓														
C8	↓	↓	↓	↓	↓	↓		↓	↓	↓				↓			↓

FOR USE OF RELIABILITY DEPT. ONLY

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605A B

C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0040 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: LSG

DATE: 1/5/71

ASSEMBLY: Board #5

SUBASSEMBLY: Caging Control

SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE/OPERATING/RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50°C (50% OF DC OPERATING VOLTAGE)	13 SPECIAL ENVIRONMENT (DETERM)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)
C1	CKR06BX105K	Aerovox	1	+10	50	15		30%	1	50		A		.01			.0005
C3																	
C4						10		20%									
C7																	
C6	CKR06BX823K		.082		100	10		10%									
C2	CKR05BX271K		270PF		200	20		10%									
C5																	

FOR USE OF RELIABILITY STAFF

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605A B

C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0035 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #14 SUBASSEMBLY: Shaft Encoder electronics SCHEMATIC NO:

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value mfd	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage Ratio, Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) @ Δ°C (See Below)	13 For Use of Reliability Dept.	14 Special Environment (Define)	15 Failure Rate Multiplier	16 Final Failure Rate	17 Total Capacitor Count Per Type	18 Total Failure Rate (%/1000 Hrs)	19
C1	CKR06BX105K	Aerovox	1	+-10	50	15		30%	1	50		A		.01				.0005	

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0005 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #15 SUBASSEMBLY: Instrument Housing Temp. Control SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OF MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OP. to RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (% / 1000 HRS) AT 35°C (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT.	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (% / 1000 HRS)	19
C9	CKR05BX100K	Aerovox	10PF	+10 -10	200	10		5%	1	50		A		.01				.0005	
C8	CKR05BX180K		18PF			10													
C7	CKR05BX220K		22PF																
C6	CKR05BX390K		39PF			20		10%											
C1	CKR05BX470K		47PF			20													
C3	↓		↓																
C11	CKR05BX103K		.01		↓	10		5%											
C2	CKR06BX104K		.1		100	10		10%											
C4																			
C5	↓		↓		↓	↓													
C6	CKR06BX473K		.47		50	5													
C12			1.0			5													
C13	↓	↓	↓	-15 +50	↓	↓		↓											
C14	16K272AB	G.E	30		50	10		20%											

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0070 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #10 SUBASSEMBLY: Power converter SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE and	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	8 OPERATING VOLTAGE PEAK AC	9 VOLTAGE RATIO, OPERATING/ RATED	10 MAXIMUM DUTY CYCLE	11 BULK AIR TEMPERATURE (°C)	12 CIRCUIT FUNCTION OR APPLICATION	13 BASIC FAILURE RATE (%/1000 HRS) 1/2 RATED POWER, °C 3/4 RATED POWER, °C	14 SPECIAL ENVIRONMENT (DESIGNATE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C4	CKR05BX151K	Aerovox	150PF	±10	200	20		10%	1	50		A		.01			.0005
C12	CKR05BX821K		820PF														
C6	CKR05BX152		1500PF														
C5	CKR06BX103K		.01														
C2	CKR06BX474K		.47														
C11	CKR06BX104K		.10														
C1	CKR06BX105K		1		50	15		30%									
C3																	
C7																	
C8																	
C9																	
C10																	

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605A B

C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0060 %/1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #1 SUBASSEMBLY: Dig Max SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or RETMA) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (% /1000 HRS) AT 50°C (SEE BELOW)	13	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (% /1000 HRS)	19
C1	SKR06BX105K	MIL-C-39014	1	+10	50	5		10%	1	50	Decoupling	A	FOR USE OF RELIABILITY DEPT	.01				.0005	

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .0005 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: LSG

DATE: 1/5/71

ASSEMBLY: Board #1

SUBASSEMBLY: Dig MUX Control

SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE %/1000 HRS AT 50°C (SEE SOURCES BELOW)	13 SPECIAL ENVIRONMENT (DESCRIBE)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)
C1	CKR06BX105K	Aerovox	1	± 10	50	5		10%	1	50	Decoupling	A		.01			.0005
C2	CKR05BX221K	↓	220PF		200	10		5%	1	50	↓	A		.01			.0005

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605A B

C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0010 % 1000 HRS

BS-321A

CAPACITORS

PROJECT: LSG DATE: 1/5/71

ASSEMBLY: Board #2 SUBASSEMBLY: Command Decoder & Driver SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGES DC	7 OPERATING VOLTAGES PEAK AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 35°C (SEE BELOW)	13 FOR USE OF RELIABILITY ANALYST	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C1	CKR06BX105K	Aerovox	1	+-10	50	5		10%	1	50		A		.01				.0005

20 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605A B
C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0005 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

PROJECT: LSG

DATE: 1/5/71

ASSEMBLY: Board #2

SUBASSEMBLY: Command Counter

SCHEMATIC NO: ____

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OF MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE (mfd)	4 TOLERANCE %	5 MANUFACTURER'S RATED VOLTAGE	6 OPERATING VOLTAGE DC	6 OPERATING VOLTAGE PEAK AC	7 VOLTAGE RATIO, OPERATING/ RATED	8 MAXIMUM DUTY CYCLE	9 BULK AIR TEMPERATURE (°C)	10 CIRCUIT FUNCTION OR APPLICATION	11 BASIC FAILURE RATE (%/1000 HRS) AT 50% STRESS (SEE REVERSE)	12 FOR USE OF RELIABILITY DEPT	13 SPECIAL ENVIRONMENT (DEFINE)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)
C1	CKR06BX105K	Aerovox	1	+-10	50	5		10%	1	50		A		.01				.0005

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ~~ATM 605A~~ B ____

C ____ D ____

21 CALCULATED MTBF ____ HRS

22 TOTAL FAILURE RATE: .0005 %/1000 HRS

BS-321A

PARTS APP[illegible]TION ANALYSIS

CAPACITORS

PROJECT: LSC

ASSEMBLY: Servo loop Module SUBASSEMBLY: oscillator

DATE: 1/5/71

SCHEMATIC NO:

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE mfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C (USE BELOW)	13 SCTR'S	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C1	ECY103R0C5	cooling	3PF	±25	50	10		20%	1	50		A		.01				.000004
C2	CKR05BX102K	Aerovox	.001	±10	200	20		10%										.0005
C3	CKR06BX105K	↓	1	↓	50	15		30%										↓
C4	CKR06BX104K	↓	0.1	↓	↓	↓		↓										
C5	HLI-472A	Marshall	4700PF	±1	100	10		10%										
C6	↓	↓	↓	↓	↓	↓		↓										
C8	CKR05BX220K	Aerovox	22PF	±10	200	20												
C7	CKR05BX390K	↓	39PF	↓	↓	↓												
C9	CKR06	↓	TBD	↓	↓	↓												
C10	↓	↓	TBD	↓	↓	↓		↓	↓	↓				↓				↓

FOR USE OF RELIABILITY DEPT.

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 A B

C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .004504 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(RELAYS)

PROJECT: LSG

DATE: 2/2/71

ASSEMBLY: Board #15

SUB ASSEMBLY: Inst. Housing Temp. Control

SCHEMATIC NO: 2362324

(Relays)

CIRCUIT REFERENCE DESIGNATION 1	TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION 2	MANUFACTURER 3	CONTACT LOAD: RATED VOLTAGE V 4	CONTACT LOAD: RATED CURRENT A 5	CONTACT LOAD: ACTUAL VOLTAGE STEADY STATE V 6	CONTACT LOAD: ACTUAL VOLTAGE PEAK V 7	CONTACT LOAD: ACTUAL CURRENT STEADY STATE A 8	CONTACT LOAD: ACTUAL CURRENT SURGE A 9	TYPE OF LOAD 10	NUMBER OF POLES: TOTAL 11	NUMBER OF POLES: ACTIVE 12	RELAY COIL: POWER MAX. RATED 13	RELAY COIL: POWER ACTUAL 14	RELAY COIL: VOLTAGE MAX. PULL IN 15	RELAY COIL: VOLTAGE MIN. OPER. 16	RATE OF OPERATIONS PER HOUR OR SECOND 17	REQ'D LIFE OPERATIONS 18	MISCELLANEOUS REMARKS 19	FAILURE RATE (%/1000 HRS) 20	SOURCE OF F.R. (SEE BELOW) 21	F.R. MODIFIER 22	TOTAL FAILURE RATE (%/1000 HOURS) 23
K_1	422D-12	Teledyne 40M47506 -33			28.95	29.6	.055	-		2	2	192 Min	65 Min	12	7					A		.0040

DEVICE AVERAGE AMBIENT TEMPERATURE °C: 50 (24)

FAILURE RATE SOURCES (FOR COLUMN NO. 21): A ATM 605B (25) B _____ C _____ D _____

CALCULATED MTBF _____ HOURS (26)

TOTAL FAILURE RATE _____ %/1000 HRS (27)

BS-321 A

PARTS APPLICATION ANALYSIS

(RELAYS)

PROJECT: LSG

DATE: 2/2/71

ASSEMBLY: Board #15

SUB ASSEMBLY: Sensor Assy. Heater Controller Monitor Assy.

SCHEMATIC NO: 2362381/2362395

(Relays)

CIRCUIT REFERENCE DESIGNATION (1)	TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION (2)	MANUFACTURER (3)	CONTACT LOAD: RATED VOLTAGE V (4)	CONTACT LOAD: RATED CURRENT A (5)	CONTACT LOAD: ACTUAL VOLTAGE STEADY STATE V (6)	CONTACT LOAD: ACTUAL VOLTAGE PEAK V (7)	CONTACT LOAD: ACTUAL CURRENT STEADY STATE A (8)	CONTACT LOAD: ACTUAL CURRENT SURGE A (9)	TYPE OF LOAD (10)	NUMBER OF POLES: TOTAL (11)	NUMBER OF POLES: ACTIVE (12)	RELAY COIL: POWER MAX. RATED (13)	RELAY COIL: POWER ACTUAL (14)	RELAY COIL: VOLTAGE MAX. PULL IN (15)	RELAY COIL: VOLTAGE MIN. OPER. (16)	RATE OF OPERATIONS PER HOUR OR SECOND (17)	REQ'D LIFE OPERATIONS (18)	MISCELLANEOUS REMARKS (19)	BASIC FAILURE RATE (%/1000 HRS) (20)	SOURCE OF F.R. (SEE BELOW) (21)	F.R. MODIFIER (22)	TOTAL FAILURE RATE (%/1000 HOURS) (23)
K_1	422D-12	Teledyne 40M47506 -32			5V		10 A	100 A		2	2	192 Min	65 Min	12	7					A		.0040
K_2	422D-12				.1V		1 A															
K_3	422D-12																					
K_4	422D-12																					
K_5	422D-12																					
K_6	422D-12	Teledyne 40M47506 -32			5V		10 A	100 A		2	2	192 Min	65 Min	12	7					A		.0040
					.1V		1 A															

DEVICE AVERAGE AMBIENT TEMPERATURE °C (24): 50

FAILURE RATE SOURCES (FOR COLUMN NO. 21) (25): A ATM 605B B _____ C _____ D _____

CALCULATED MTBF _____ HOURS (26)

TOTAL FAILURE RATE .0240 %/1000 HRS (27)

BS-321 A

PARTS APPLICATION ANALYSIS

(RELAYS)

PROJECT: LSG DATE: 2/2/71

ASSEMBLY: Board #5 SUB ASSEMBLY: Caging Control SCHEMATIC NO:

(Relays)

1 CIRCUIT REFERENCE DESIGNATION	2 TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	CONTACT LOAD							NUMBER OF POLES		RELAY COIL						19 MISCELLANEOUS REMARKS	20 BASIC FAILURE RATE (%/1000 HRS)	21 SOURCE OF F.R. (SEE BELOW)	22 F.R. MODIFIER	23 TOTAL FAILURE RATE (%/1000 HOURS)
			RATED		ACTUAL							POWER		VOLTAGE								
			4 VOLTAGE V	5 CURRENT A	6 VOLTAGE STEADY STATE V	7 VOLTAGE PEAK V	8 CURRENT STEADY STATE A	9 CURRENT SURGE A	10 TYPE OF LOAD	11 TOTAL	12 ACTIVE	13 MAX. RATED	14 ACTUAL	15 MAX. PULL IN	16 MIN. OPER.	17 RATE OF OPERATIONS PER HOUR OR SECOND	18 REQ'D LIFE OPERATIONS					
K_1	422D-12	Teledyne 40M47506 -33								2	2	192 Min	65 Min	12	7					A		.0040

24 DEVICE AVERAGE AMBIENT TEMPERATURE 50 °C

25 FAILURE RATE SOURCES (FOR COLUMN NO. 21)
A ATM 605B B
C D

26 CALCULATED MTBF _____ HOURS

27 TOTAL FAILURE RATE .0040 %/1000 HRS

BS-321 A

PARTS APPLICATION ANALYSIS

(RELAYS)

PROJECT: LSG

DATE: 2/2/71

ASSEMBLY: Board #4 and #5

SUB ASSEMBLY: Screw Servo

SCHEMATIC NO:

(Relays)

CIRCUIT REFERENCE DESIGNATION 1	TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION 2	MANUFACTURER 3	CONTACT LOAD: RATED VOLTAGE V 4	CONTACT LOAD: RATED CURRENT A 5	CONTACT LOAD: ACTUAL VOLTAGE STEADY STATE V 6	CONTACT LOAD: ACTUAL VOLTAGE PEAK V 7	CONTACT LOAD: ACTUAL CURRENT STEADY STATE A 8	CONTACT LOAD: ACTUAL CURRENT SURGE A 9	TYPE OF LOAD 10	NUMBER OF POLES: TOTAL 11	NUMBER OF POLES: ACTIVE 12	RELAY COIL: POWER MAX. RATED 13	RELAY COIL: POWER ACTUAL 14	RELAY COIL: VOLTAGE MAX. PULL IN 15	RELAY COIL: VOLTAGE MIN. OPER. 16	RATE OF OPERATIONS PER HOUR OR SECOND 17	REQ'D LIFE OPERATIONS 18	MISCELLANEOUS REMARKS 19	BASIC FAILURE RATE (%/1000 HRS) 20	SOURCE OF F.R. (SEE BELOW) 21	F.R. MODIFIER 22	TOTAL FAILURE RATE (%/1000 HOURS) 23
K_1	422D-12	Teledyne 40M47506 -33								2	2	192 Min	65 Min	12	7						A		.0040
K_2	422D-12	Teledyne 40M47506 -33								2	2	192 Min	65 Min	12	7						A		.0040

DEVICE AVERAGE AMBIENT TEMPERATURE 50 °C (24)

FAILURE RATE SOURCES (FOR COLUMN NO. 21) (25)
A ATM 605B B
C D

CALCULATED MTBF _____ HOURS (26)

TOTAL FAILURE RATE .0080 %/1000 HRS (27)

BS-321 A

PARTS APPLICATION ANALYSIS

(RELAYS)

PROJECT: LSG DATE: 2/2/71

ASSEMBLY: Board #4 SUB ASSEMBLY: Tilt Servo Control SCHEMATIC NO:

(Relays)

1 CIRCUIT REFERENCE DESIGNATION	2 TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	CONTACT LOAD: 4 RATED VOLTAGE V	5 RATED CURRENT A	6 ACTUAL VOLTAGE STEADY STATE V	7 ACTUAL VOLTAGE PEAK V	8 ACTUAL CURRENT STEADY STATE A	9 ACTUAL CURRENT SURGE A	10 TYPE OF LOAD	11 NUMBER OF POLES TOTAL	12 NUMBER OF POLES ACTIVE	RELAY COIL: 13 POWER MAX. RATED	14 POWER ACTUAL	15 VOLTAGE MAX. PULL IN	16 VOLTAGE MIN. OPER.	17 RATE OF OPERATIONS PER HOUR OR SECOND	18 REQ'D LIFE OPERATIONS	19 MISCELLANEOUS REMARKS	20 BASIC FAILURE RATE (%/1000 HRS)	21 SOURCE OF F.R. (SEE BR-LOW)	22 F.R. MODIFIER	23 TOTAL FAILURE RATE (%/1000 HOURS)
K_1	422D-12	Teledyne 40M47506 -33								2	2	192 Min	65 Min	12	7					A		.0040
K_2	422D-12	↓								2	2	192 Min	65 Min	12	7					A		.0040
K_3	422D-12	Teledyne 40M47506 -33								2	2	192 Min	65 Min	12	7					A		.0040

24 DEVICE AVERAGE AMBIENT TEMPERATURE 50 °C

25 FAILURE RATE SOURCES (FOR COLUMN NO. 21) A ATM 605B B C D

26 CALCULATED MTBF _____ HOURS

27 TOTAL FAILURE RATE .0120 %/1000 HRS

BS-321 A

PARTS APPLICATION ANALYSIS

(RELAYS)

PROJECT: LSG

DATE: 2/2/71

ASSEMBLY: Board #7

SUB ASSEMBLY: Seismic Amp. & Filter

SCHEMATIC NO:

(Relays)

1 CIRCUIT REFERENCE DESIGNATION	2 TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	CONTACT LOAD: 4 RATED VOLTAGE V	5 RATED CURRENT A	6 ACTUAL VOLTAGE STEADY STATE V	7 ACTUAL VOLTAGE PEAK V	8 ACTUAL CURRENT STEADY STATE A	9 ACTUAL CURRENT SURGE A	10 TYPE OF LOAD	11 NUMBER OF POLES TOTAL	12 NUMBER OF POLES ACTIVE	RELAY COIL: 13 POWER MAX. RATED	14 POWER ACTUAL	15 VOLTAGE MAX. PULL-IN	16 VOLTAGE MIN. OPER.	17 RATE OF OPERATIONS PER HOUR OR SECOND	18 REQ'D LIFE OPERATIONS	19 MISCELLANEOUS REMARKS	20 BASIC FAILURE RATE (%/1000 HRS)	21 SOURCE OF F.R. (SEE BELOW)	22 F.R. MODIFIER	23 TOTAL FAILURE RATE (%/1000 HOURS)
K_1	422D-12	Teledyne 40M47506 -33								2	2	192 Min	65 Min	12	7					A		.0040

24 DEVICE AVERAGE AMBIENT TEMPERATURE: 50 °C

25 FAILURE RATE SOURCES (FOR COLUMN NO. 21): A ATM 605B; B ____; C ____; D ____

26 CALCULATED MTBF ____ HOURS

27 TOTAL FAILURE RATE .0040 %/1000 HRS

BS-321 A

PARTS APPLICATION ANALYSIS

(RELAYS)

PROJECT: LSG DATE: 2/2/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Stabilized Osc. SCHEMATIC NO:

(Relays)

CIRCUIT REFERENCE DESIGNATION 1	TYPE DESIGNATION (CSC, MIL OR MFR) AND CONSTRUCTION 2	MANUFACTURER 3	CONTACT LOAD: RATED VOLTAGE V 4	CONTACT LOAD: RATED CURRENT A 5	CONTACT LOAD: ACTUAL VOLTAGE STEADY STATE V 6	CONTACT LOAD: ACTUAL VOLTAGE PEAK V 7	CONTACT LOAD: ACTUAL CURRENT STEADY STATE A 8	CONTACT LOAD: ACTUAL CURRENT SURGE A 9	TYPE OF LOAD 10	NUMBER OF POLES: TOTAL 11	NUMBER OF POLES: ACTIVE 12	RELAY COIL: POWER MAX. RATED 13	RELAY COIL: POWER ACTUAL 14	RELAY COIL: VOLTAGE MAX. PULL IN 15	RELAY COIL: VOLTAGE MIN. OPER. 16	RATE OF OPERATIONS PER HOUR OR SECOND 17	REQ'D LIFE OPERATIONS 18	MISCELLANEOUS REMARKS 19	FAILURE RATE DATA: BASIC FAILURE RATE (%/1000 HRS) 20	FAILURE RATE DATA: SOURCE OF F.R. (SEE BELOW) 21	FAILURE RATE DATA: F.R. MODIFIER 22	TOTAL FAILURE RATE (%/1000 HOURS) 23
K_1	422D-12	Teledyne 40M47506 -33								2	2	192 Min	65 Min	12	7						A		.0040

DEVICE AVERAGE AMBIENT TEMPERATURE 50 °C (24)

FAILURE RATE SOURCES (FOR COLUMN NO. 21) (25)
A ATM 605 B B
C D

CALCULATED MTBF _____ HOURS (26)

TOTAL FAILURE RATE .0040 %/1000 HRS (27)

BS-321 A

PARTS APPLICATION ANALYSIS

(RELAYS)

PROJECT: LSG DATE: 2/2/71

ASSEMBLY: Board #8 SUB ASSEMBLY: Demod-Integrator SCHEMATIC NO:

(Relays)

1 CIRCUIT REFERENCE DESIGNATION	2 TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	CONTACT LOAD: 4 RATED VOLTAGE V	5 RATED CURRENT A	6 ACTUAL VOLTAGE STEADY STATE V	7 ACTUAL VOLTAGE PEAK V	8 ACTUAL CURRENT STEADY STATE A	9 ACTUAL CURRENT SURGE A	10 TYPE OF LOAD	NUMBER OF POLES: 11 TOTAL	12 ACTIVE	RELAY COIL: 13 POWER MAX. RATED	14 POWER ACTUAL	15 VOLTAGE MAX. PULL IN	16 VOLTAGE MIN. OPER.	17 RATE OF OPERATIONS PER HOUR OR SECOND	18 REQ'D LIFE OPERATIONS	19 MISCELLANEOUS REMARKS	20 BASIC FAILURE RATE (%/1000 HRS)	21 SOURCE OF F.R. (SEE BELOW)	22 F.R. MODIFIER	23 TOTAL FAILURE RATE (%/1000 HOURS)
K_1	422D-12	Teledyne 40M47506 -33								2	2	192 Min	65 Min	12	7					A		.0040

24 DEVICE AVERAGE AMBIENT TEMPERATURE 50°C

25 FAILURE RATE SOURCES (FOR COLUMN NO. 21) A ATM 605B B C D

26 CALCULATED MTBF _____ HOURS

27 TOTAL FAILURE RATE .0040 %/1000 HRS

BS-321A

	PART DESCRIPTION	MFG. PART NO.	RELIABILITY SOURCE REF.	% OF RATED TORQUE	% OF RATED CURRENT	°C OPERATING TEMP.	FAILURE RATE % / 1.000 HRS.
1	Connector	Cannon DDH 50 P	Farada (1A)p. 2.73	50	50	50	.02
		Cannon DBH 25 P	Farada (1A)p. 2.73	50	50	50	.02
	Connector leads (solder joints)		MIL-HDBK-217A p. 7.11-1			50	.00020
2	Arrestment Motor	Globe 43A146-2	Farada (1A) p. 2.133	33		50	1.43
3	Clutch	PIC T18-3	Farada (1A) p. 2.432	32		50	.0507
3	Ball Bearings		Farada (1A) p. 2.411			50	.0532
4	Pin Stop Drive	ADL				50	
5	Mass Changing Motor	Globe 128A174-11	Farade(1A) 1. 2.133	33		50	1.43
6	O-Ring Clutch	ADL	Est. 3 x 10	32		50	.507
7	Gears		Farada (1B) p. 2.411			50	.358
	Bearings		Farada (1A) p. 2.411			50	.0532
8	Potentiometer	Bourns # 37005-1-104	Farada (1A) 1. 2.186			50	.591
9	Mass Changing Limit Stop	ADL				50	
10	Coarse Screw Motor	IMC 008-949	Farada (1A) p. 2.133	12		50	.175

	PART DESCRIPTION	MFG. PART NO.	RELIABILITY SOURCE REF.	% OF RATED TORQUE	% OF RATED CURRENT	°C OPERATING TEMP.	FAILURE RATE %/ 1,000 HRS.
11	Clutch Gears & Bearings	See 3 & 7		32		50	.462
12	Revolution Counter (STOP)		Farada p. 2.448			50	.507
13	Fine Screw Motor	IMC 008-949	Farada 1A p. 2.133	12		50	.175
14	Clutch Gears & Bearings	See 11		32		50	.462
15	Revolution Counter	Same as 12				50	.507
16	Leveling Motors	IMC 008-845-24				50	.175
17	Gimbal Suspension					50	0
18	Thermal Control	Heater Box Heater 1680-1800 r	Farada 1B p. 2.499	60	60	50	.019
18		Instru. H's'g Heater 104-108 r	Farada 1B	1.2 Night 80% 22 Day 3%	1.2 Night 80% 22 Day 3%	50	.019
18		Survival Heater 192-196 r	Farada 1B p. 2.499			50	.019
18	Heater Potting Material					50	0
18	Instrument Hsg. Insulation		Farada 1B p. 2.520			50	0

	PART DISCRIPTION	MFG PART NO.	RELIABILITY SOURCE REF.	% OF RATED TORQUE	% OF RATED CURRENT	°C OPERATING TEMP.	FAILURE RATE %/1,000 HRS
19	Pressure Control	O-Ring				50	0
19	Thermistor	Yellow Springs Inst. Co	Farada 1 B p. 2.598			50	.077
20 21	Fine & Coarse Screw ENCODERS	Librascope 719-11-5	Farada 1B p. 2.563			50	1.482 (LT)